

Book of Abstracts

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812. Bridging the 'Great Disconnect': Overcoming Methodological Hurdles in the Use of eDNA to Study Food Web Interactions of American Lobster Larvae

- Curtis Morris
- Peter Countway
- Alex Ascher
- David M. Fields
- Richard A. Wahle

813. Utilizing Landscape Design Principles to Improve Green Spaces and Promote Ecotherapy on a College Campus

• Jessica Hutchinson

• Stephanie Burnett

814. Uncovering the Mycorrhizal Connections Between Mature Trees and Seedlings of Ancient Red Spruce Forests on a Coastal Maine Island

- Evan Warburton
- Pete Avis

815. Assessing Microplastic Risks in Maine's Agricultural Systems

- Denise Cole
- Anne Lichtenwalner

816. Initial Descriptions of the Microbes of Farmed Atlantic Sea Scallop (*Placopecten magellanicus*) Veligers and Rearing Tanks

- Sarah Hosler
- Erin Grey
- Adwoa Dankwa
- Jennifer Perry
- Tim Bowden
- Brian Beal
- Suzanne Ishaq

817. Investigation of the ca. 1100 BP White River Ash Eruption in the Denali Ice Core Record

- Hanna Brooks
- Karl Kreutz

818. Characterization and Modification of Residual Biochar Sourced From Maine for Application Wild Blueberries

- Abigayl Novak
- Jessica Hutchinson
- Ling Li
819. Isolating and Identifying *Staphylococcus* Bacteriophage From the Black Soldier Fly Larval Gut

- Audrie French
- Edward Bernard

820. COVID-19 and Outdoor Recreation in Maine and New Hampshire: Analysis of Trends Using Passive Visitation Data

- Andrea Knapp
- Jessica Leahy

821. Cosmogenic Isotope Analysis of Basal Sediment found in Mt. Hunter Ice Cores

- Katie Westbrook
- Karl Kreutz

822. The Effect of Climate Change and Topography on Tropical Glaciers

- Samuel Holbrook
- Alice Doughty

823. Blood Parasite Co-infections Associated with Anthrax Mortality in Plains Zebra

- Allison Weymouth
- Logan Christian
- Hannah Lembree
- Claire Nowak
- Melanie Prentice
- Pauline Kamath

824. Comparative Analysis of *Primnoa Pacifica*, Red Tree Coral, Gamete Size Before versus After Thermal Variability Events

- Jocelyn Cooper
- Rhian Waller

825. Income and Food Insecurity within Households: Evidence from a Universal Income Transfer

- Prianka Sarker
- Caroline Noblet
- Angela Daley

826. Assessing Mg/Ca as a Key to Past Ocean Temperature in the Southern Jordan Basin, Gulf of Maine

- Alexandria Thompson
- Madelyn Woods
- Alicia Cruz-Uribe
- Katherine Allen

827. Reconstruction of Historical Glaciers in Scotland

- Elyeah Schweikert
- Alice Doughty

828. Anaplasma Prevalence and Distribution in Maine Moose Populations

- Zachary Pecora
- Alaina Woods
- Pauline L. Kamath

829. Development of Wood-fiber Insulated Panels (WIPs) for Prefabricated Modular Construction and Retrofit Applications

- Jake Snow
- Benjamin Herzog
- Samuel Glass
- Stephen Shaler
- Ling Li

830. Assessing the Veterinary Needs of Rural Maine and Implementing an Effective Management Plan

• Marielle Pelletier

- Tegwin Taylor
- Sue Ishaq

831. How Did Extinct Ice Age Mega-herbivores Affect Soil Nutrient Cycling?

- Noa Buzby
- Jacquelyn Gill

832. Suppression of Methicillin-resistant *Staphylococcus aureus* Using Larvae of Black Soldier Fly, *Hermetia illucens*

- Matthew Moyet
- Marissa Kinney
- Edward Bernard
- Andrei Alyokhin

833. Chemical Weathering of Serpentine in a Tropical Environment: Implications for Silicate Weathering on Mars

- Francis Sternberg
- Amanda A. Olsen

834. The Role of FNPs Within Primary Care in Providing Pregnancy Options Counseling

- Natalie Nicols
- Eva Quirion

835. Comparison of Seasonal Climate Change Patterns Among the Wild Blueberry Fields at DifferentCcounties of Maine, USA

- Sam Roberts
- Rafa Tasnim
- Yongjiang Zhang

836. Prevalence of Heat Stable *Staphylococcal* Enterotoxins in Mastitis Isolates in Maine - Withdrawn From Judging

- Autumn Hunter
- Anne Lichtenwalner

837. The Effects of Heat Stress, Land Use, and the Expansion of Ixodes Ticks on Pathogen Emergence

- Joseph Beale
- Sue Ishaq
- Danielle Levesque
- Pauline Kamath

838. Antioxidant Effects of Winterberry (*Ilex verticillata*) Leaf Extract in *Caenorhabditis elegans*

- Cara McKinnon
- Brendan Moline
- Michael Croft
- Leah Mastrianno
- Samuel W. Caito
- Jennifer L. Newell-Caito

839. How Do Direct Seafood Marketers Label The Marketing Channels They Engage With?

- Talia Moore
- Josh Stoll
- Sahir Advani

840. Integrated Pest Management for the Control and Prevention of Gastropod Vectors on Pastures

- Rachel White
- Denise Cole
- Anne Lichtenwalner

841. Using Paleolimnological Tools to Evaluate the Links Between Climate Change and CyanoHABs in Maine Lakes

- Avery Lamb
- Jasmine Saros

842. A Social-ecological Examination of Seasonal Dynamics in the Maine Lobster Fishery

- Emily Fitting
- Teresa R. Johnson
- Yong Chen

843. Evaluating the Relationship Between Wild Turkey Movement Ecology and Roads

- Kyle Smelter
- Stephanie Shea
- Pauline Kamath
- Kelsey Sullivan
- Erik Blomberg

844. Social-ecological Effects on Mosquito Populations Across Land Use in Bangor, Maine - Withdrawn From Judging

- Megan Schierer
- Allison Gardner
- Sandra De Urioste-Stone

845. Recyclable Bio-based Composites with Excellent Oil and Water Barrier Poperties for Food Serving Applications

- Rakibul Hossain
- Mehdi Tajvidi

846. Aim for Slug-cess: Testing Mitochondrial DNA Sequencing Methods for New England Nudibranch Species

- Ian Birchler De Allende
- Erin Grey

847. The Effect of Drying on the Survival of *Escherichia coli*, *Listeria innocua* and *Bacillus cereus* on Sugar Kelp

- Richa Arya
- Jennifer Perry
- Denise Skonberg

848. Turning Recycled Cardboard Containers into High Gas Barrier UV-protective Packaging Film

- Md Ikramul Hasan
- Jinwu Wang
- Mehdi Tajvidi

849. The Incidence of Staphylococcus aureus Mastitis in Maine Dairy Cattle

- Morgan Belvin
- Anne Lichtenwalner

850. Response of Low (Wild) and Highbush Blueberries to Extreme Drought: Threshold of Coordinated Declines in Physiological Processes and Branch Dieback

- Pratima Pahadi
- Yongjiang Zhang

851. Identifying Umbrella Species to Inform the Conservation of Intertidal Areas in Acadia National Park.

- Abigail Muscat
- Bik Wheeler
- Elliot Johnston
- Brian Olsen

852. The Effect of Education on HPV Vaccination Status in Females - Withdrawn From Judging

- Madeline Manfredonia
- Shannon Brunken
- Lindsay Bland
- Gabrielle Gamache
- Brianna Rambo
- Valerie Herbert

853. Effects of *Vibrio Parahaemolyticus* and *Aeromonas hydrophilia* on the Development of Black Soldier Fly Larvae.

- Grace Harman
- Matthew Moyet
- Bernard Edward

854. Effects of Nanocellulose Treatment in Drought Response of Maine Wild Blueberries

- Aldous Hofmann
- Yongjiang Zhang

855. The Comparison of Management Practices to Control Intestinal Parasites in Companion and Production Pigs

- Kianna Dean
- Anne Lichtenwalner

856. A Study on the Mechanical Behavior of SDCNFs Reinforced PP Composite

- Sungjun Hwang
- Collen Walker
- Yousoo Han
- Douglas Gardner

857. Abstract Moved to Biomedical Sciences

858. Linking Molecular Deadwood Inhabiting Fungi to the Decomposition Rates of Coarse Woody Debris

- Elyse Daub
- Peter Avis

859. Evaluation of Preservation Techniques for Kombucha Starter Cultures

- Adwoa Dankwa
- Jennifer Perry

860. Post-Harvest Treatment Effects on Physicochemical Properties and Composition of North Atlantic Squid

- Caitlin Hillery
- Denise Skonberg

861. Hoxb5 Genes May Promote Muscle Precursor Migration in Zebrafish Embryos

- Sophie Craig
- Tayo Adekeye
- Cecilia Moens
- Jared Talbot

862. Disinfestation Methods Affect Development of Early Peach Embryos in Tissue Culture

- Courtney Hawkins
- Bryan Peterson

863. Abstract Moved to Biomedical Sciences

864. Abstract Withdrawn

865. Non-Narcotic Pain Interventions and the Effectiveness of Decreasing Pain - Withdrawn From Judging

- Sarah Brindisi
- PhilAnn Dixon
- Bridget Gessner
- Lauren Dergoatis
- Kelley Strout

866. A Concept Map of Icefield-to-ocean Linkages in Southeast Alaska

- Katie Westbrook
- Caeli Connolly
- Amanda Fay
- Karl Kreutz

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901. Comparing Municipal COVID-19 Response in Inland vs. Coastal Communities in Maine

- Tamra Benson
- Ben Cotton
- Annie Coburn
- Kathleen Bell
- Vanessa Levesque
- Eileen Johnson

902. Embodiment as a Theme and Process in Collaborative Research

- Jennifer Smith-Mayo
- Michael Clay
- Bridie McGreavy
- Heather Leslie
- Angela Wotton

903. Promoting Health for Passamaquoddy Tribal Members through Alternative Energy Solutions

- Jasmine Lamb
- Mary O'Flaherty
- Sharon Klein

904. The Use of Augmented Reality to Monitor Coastal Erosion

- Nicholas Sherman
- Elijah Story
- Michael Scott

905. EDGE AR - Detect Your Surroundings

- David Lavoie
- Jon Ippolito

906. Bangor Pride Mobile App - Withdrawn From Judging

- Alyssa Demanche
- Jon Ippolito

907. Detecting Shared Touch Surface Contamination with a Deep Learning-Enhanced Smartphone and Nanopatterned Material System

- Ainslie Allen
- Josh Andle
- Oisin Biswas
- RJ Perry
- Salimeh Yasaei Sekeh
- Caitlin Howell

908. Understanding Sense of Place in Maine Through Community Cookbooks

- Rachel Church
- Susan Smith

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1001. Role of Heme Oxygenase in Endurance Neuromuscular Electrical Stimulation Mediated Improvement of Dystrophic Skeletal Muscle

- Amanda Ignacz
- Elisabeth Kilroy
- Kodey Silknitter
- Clarissa Henry

1002. Mouse Models of NADK2 Deficiency Analyzed for Metabolic and Gene Expression Changes to Elucidate Pathophysiology

- George Murray
- Robert Burgess

1003. Continuous, Non-Destructive Detection of Surface Bacterial Growth with Bioinspired Vascularized Polymers

- Brandon Dixon
- Anna Briley
- Caitlin Howell

1004. Characterization of the Human Cardiac Progenitor Cell Secretome - Withdrawn From Judging

- Michayla Moore
- Calvin Vary

1005. Mybl2 is a Developmental Control Gene that Regulates Asymmetry and Dynamic Expression of Genes in the Cochlea

- Caryl Young
- Matthew Thompson
- Vidhya Munnamalai

1006. Low-Dose Arsenic Exposure Alters the Expression of Genes Associated with Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Exposure in Zebrafish Embryos

- Marissa Paine
- Meaghan Caron
- Emma Boudreaux
- Brendan Moline
- Keith Hutchison
- Benjamin King

1007. The Mysterious Gordonia Phage Widow - Withdrawn From Judging

- Wyatt Oglesby
- Ben Curtis
- Griffin Lawrence
- Jaylee Rice
- Emelia Tremblay
- Bayarjavkhlan Ganbaatar
- Melody Neely

1008. Creating Efficient Anti-Bacterial Surfaces on Catheters with Antibiotic-Free Liquid Coatings

- Chun Ki Fong
- Marissa Andersen
- Caitlin Howell

1009. Triacsin C Inhibition of Acyl-CoA Synthetases Hinders Multiple Myeloma Cell Proliferation and Survival

- Connor Murphy
- Heather Fairfield
- Mariah Farrell
- Victoria DeMambro
- Calvin Vary
- Michaela Reagan

1010. Deletion of Mycobacterial Flotillin Gene to Assess Changes in Virulence of *Mycobacterium chelonae*

- Claire Bourett
- Sally Molloy

1011. Designing a Functional Trunnion Prototype for Attachment of an Artificial Leg to a Femoral Implant to Be Used for Osseointegrated Prosthetics

- Emma Sperry
- David Neivandt

1012. Microfluidic Chanel Applications to Improve a Pulsed-Electric Field Water Purification System

- Amelia Cobb
- Liza White
- Caitlin Howell

1013. Synthesis and Decarboxylation of Eumelanoids

• Alexander Wilkins

• Matthew Brichacek

1014. AAV9-Ighmbp2 Gene Therapy Significantly Improves Motor Performance in Severe SMARD1-like Mouse Model, nmdem3, and CMT2S Mouse Model, nmdem5

- Sarah Holbrook
- Amy Hicks
- Paige Martin
- Greg Cox

1015. Cohabitating Prophage Interactions and their Role in Regulation of Important Mycobacterial Antibiotic Resistance Genes

- Matthew Cox
- Sally Molloy

1016. Determining the Role of Paratox in Streptococcus agalactiae: Virulence and Bacterial Fitness

- Hannah Maurais
- Caitlin Wiafe-Kwakye
- Melody Neely

1017. JC Polyomavirus Infection is Reduced by Repurposed Therapeutics

- Avery Bond
- Mason Crocker
- Michael Wilczek
- Nicholas Leclerc
- Melissa Maginnis

1018. Interactions Between Co-habitating Prophages Increases Expression of Mycobacterial Intrinsic Resistance Gene, whiB7

- Sarah McCallister
- Matthew Cox
- Jaycee Cushman
- Keith Hutchison
- Joshua B Kelley

• Sally Molloy

1019. Nanoparticles as Local Reporters in Biological Systems: Modeling Signal and Understanding Limitations

- Jeremy Grant
- Aimee Co
- Michael Mason

1020. No More Excu-SES: It's Time to Address Class and Cognitive Function

- Zoe Prats
- Angel Boeve
- Lily Brown
- Madison Landry
- Rebecca MacAulay

1021. Overrepresentation of Kidney Development Function Among 937 Genes Associated with Chronic Kidney Disease in 21 Genome-Wide Association Studies Across Multiple Patient Populations.

- Omodasola Adekeye
- Benjamin King

1022. Investigating Disruptions in Axon Guidance in Dystroglycanopathy

- Kodey Silknitter
- Benjamin King
- Clarissa Henry

1023. Investigating the Impact of Prophages on Bacterial Fitness of Streptococcus Agalactiae

- Caitlin Wiafe-Kwakye
- Sally Molloy
- Melody Neely

1024. Differential Expression of Interferon Response Genes in the Innate Immune Response to Influenza A Virus Infection

- Julianna Grampone
- Brandy-Lee Soos
- Benjamin L. King

1025. Determining the Role of Prophage McProf Gene Products in *Mycobacterium chelonae* Antibiotic Resistance

- Hector Orellana
- Sarah McCallister
- Sally Molloy

1026. The Danger of Prophage and its Effect on the Virulence of Streptococcus Agalactiae

- Caiden Fraser
- Caitlin Wiafe-Kwakye
- Melody Neely

1027. DMC9 Prophage Characterization and Impact on Group B Streptococcus Virulence

- Katie Southworth
- Hannah Maurais
- Caitlin Wiafe-Kwakye
- Melody Neely

1028. Continuous Monitoring of Contamination on Surfaces via Structural Color Analysis

- Oisin Biswas
- Caitlin Howell

1029. Characterization of a Group B Streptococcus Prophage

- Robin Southwick
- Caitlin Waife-Kwakye
- Melody Neely

1030. MicroRNA Regulation of Neutrophil Inflammation Regulation during Influenza A Virus Infection

- Riley Grindle
- Brandy-Lee Soos
- Benjamin King

1031. Characterization of the Cluster MabR Prophages of *Mycobacterium abscessus* and *Mycobacterium chelonae*

- Jacob Cote
- Colin Welch
- Madeline Kimble
- Dakota Archambault
- John Curtis Ross
- Sally Molloy

1032. Regulation of Microtubule Dynamics During the Pheromone Response in Saccharomyces Cerevisiae

- Loren Genrich
- Joshua Kelley
- Cory Johnson

1033. VO2 Max Testing

- Evan Bess
- Cole Perry
- Thomas Bowie
- Oliviah Damboise
- Michael Mason

1034. Evaluating Ca2+ Related Drugs for Inhibition of JC Polyomavirus Infection

- Amanda Sandberg
- Avery Bond
- Melissa Maginnis

1035. Quantifying Birefringence Images of Zebrafish Using a Mix of Deep Neural Networks and Image Analysis Tools

- Ahmed Almaghasilah
- Clarissa Henry
- Joshua Kelley

1036. Role of the HU177 Cryptic Collagen Epitope in Differentially Controlling Breast Tumor Cell Behavior

- Jordan Miner
- Peter Brooks

1037. Testing Effects of Newly Isolated Prophage on Mycobacterial Drug Resistance

- Andre Daigle
- Katelyn Amero
- Eleanor Carrolton
- Sally Molloy

1038. The Impact of Calmodulin Signaling on JC Polyomavirus Infection

- Aiden Pike
- Michael Wilczek
- Melissa Maginnis

1039. Aging and Connectivity in Dendritic Spines

- Marissa Ruzga
- Erik Bloss

1040. Spatial Frequency Domain Imaging Applications in Diabetic Testing

- Christian Crane
- Chisom Orakwue
- Anna Baldwin
- Karissa Tilbury

1041. Effect of Pharmaceutical Agent Cetylpyridinium Chloride on Early Tyrosine Phosphorylation Events in Immune Mast Cells

- Marissa Paine
- Bright Obeng
- Lucas Bennett
- Patrick Fleming
- Julie Gosse

1042. Building Literacy in Microscopy and Reproducible Image Analysis

- Dominic Crowley
- Loren Genrich
- Marcus Ratz
- Sophie Trafton
- Karissa Tilbury
- Frédéric Bonnet

1043. Biometric Enabled Aviation Helmet - Withdrawn From Judging

- Naomi Kihn
- Haley Florio
- Sadie Denico
- Giordano Luciani
- Karissa Tilbury

1044. The Impact of Cxcr4/Cxcl12 on Migrating Muscle Precursors

- Sara Loiselle
- Jared Talbot

1045. Neuronal Transient Receptor Potential Melastatin-8 Cation (TRPM8) Channel may Regulate Bone Mass via Mesenchymal Stem/Stromal Cell Maintenance

- Audrie Langlais
- Adriana Lelis Carvalho
- Katherine Motyl

1046. Smart Paper Diagnostics

- Emma Sperry
- Kara Frasier
- Dillon Kelley
- Francois Rukumbuzi
- James Beaupre

1047. Interferon Response Factor 7 is a Transcriptional Target of Nuclear Factor Kappa B (NFkB)-Mediated Inflammation Following Influenza A Virus Infection

- Wyatt Cannell
- Emma Boudreaux
- Sarah MacLeod
- Brandy-Lee Soos
- Benjamin King

1048. Nociceptor Sensitivity in Larval and Adult Drosophila

- Christine Hale
- Samia Pratt
- Julie Moulton
- Geoffrey Ganter
- Emma Boudreaux

1049. Life-long Dietary Restrictions have Negligible and Potentially Damaging Effects on Late-life Cognitive Performance in the Diversity Outbred Mouse Population - **Withdrawn From Judging**

- Andrew Ouellette
- Niran Hadad
- Andrew Deighan
- Laura Robinson
- Adam Freund
- Gary Churchill
- Catherine Kaczorowski

1050. Optimization of Proteolytic Collagen Degradations to Enable Identification of SHG Signatures Associated with Proteolytic Degradation

- Madison Mueth
- Jordan Miner
- Karissa Tilbury

1051. Novel Gordonia Phage StarStruck: A Shining Light for Discovery - Withdrawn From Judging

- Julia Coombs
- Eleanor Carrolton
- Wyatt Cannell
- Addie Gambol
- Mchenna Martin
- Sally Molloy

1052. Mitochondrial Toxicity of Antimicrobial Agent Cetylpyridinium Chloride

- John Burnell
- Sasha Weller
- Brandon Aho
- Bright Obeng
- Samuel Hess
- Julie Gosse

1053. Variable Mest Expression in Genetically Identical Mice Contributes to Obesity

- Madeleine Nowak
- Rea Anunciado-Koza
- Crystal Bilodeau
- Edward Jachimowicz
- Robert Koza

1054. Exercise Induced Growth Factor Increases as a Function: Translational Project Among Human and Animal Models of Preclinical Alzheimer's Disease

- Amanda Wain
- Kate Foley

- Lindsey Lagerstrom
- Jennifer Thompson
- Taylor Mcmillan
- Fayeza Ahmed

1055. Characterization of Four Novel Prophages and Their Polymorphic Toxin Systems in the Pathogenic *Mycobacterium salmoniphilum* - **Withdrawn From Judging**

- Sam Kovacs
- Emma Boudreaux
- Wyatt Cannell
- Eleanor Carrolton
- Sophie Childs
- Veronica Chuns
- Julia Coombs
- Abigail Dichiara
- Addie Gambol
- Oyku Goktug
- Amy Hardy
- Parker Landsbergen
- Hanna Lembree
- McHenna Martin
- Abi McNally
- Dorian Royal
- Alexander Russell
- Annika Savage
- Makayla Sisco
- Maple Waltner
- Sally Molloy

1056. Asymmetric Catalysis of Chiral Phosphate Mimics

- Rebecca Collins
- Ahmed Numan
- Matthew Brichacek

1057. Novel Method Of Measuring Bone Density Using Audible Sound

• Evan Bess

- Justin Williford
- Michael Mason

1058. Skin Formation of Crosslinked TEMPO Cellulose Nanofiber Hydrogel

- Jacob Holbrook
- Kora Kukk
- Michael Mason

1059. Time-lapse Imaging Reveals That Muscle Precursor Position is a Key Determinant of Fin Muscle Fate in Zebrafish

- Carolina Cora
- Jared Talbot

1060. ColorFlu Zebrafish: An In Vivo Fluorescent Influenza A Virus Infection Model

- Brandy-Lee A. Soos
- Benjamin King

1061. Toxin/Antitoxin Systems in Prophage Genomes Could Increase Virulence in the Host, Group B Streptococcus.

- Kaitlyn Jodoin
- Caitlin Wiafe-Kwakye
- Melody Neely

1062. Deciphering the Signaling Mechanisms of JC Polyomavirus

- Remi Geohegan
- Michael Wilczek
- Lauren Cusson
- Sophie Craig
- Melissa Maginnis

1063. Defining the Role of Src Kinase in Activation of the MAPK/ERK Signaling Pathway During JCPyV Infection

- Lauren Cusson
- Remi Geohegan
- Sophie Craig
- Melissa Maginnis

1064. Tailoring Personalized Medicine to Treat Diseases Caused by Genetic Mutations

- George Horvat
- Katelyn Amero
- Lindsey Stover
- Alison Kueck
- Denry Sato
- Bruce Stanton
- Benjamin L. King

1065. The Regulation of Autophagy During The Yeast Pheromone Response

- Mustafa Elhefnawi
- Cory Johnson
- Joshua Kelley

1066. Exploring Proteomic Signatures of Lean Perivascular Adipose Tissue Induced by Methionine Restricted Diet

- Marissa McGilvrey
- Bethany Fortier
- Calvin Vary
- Robert A Koza
- Lucy Liaw

1067. Cardiac Risk and Cognition in Middle Aged Adults

- Jaclyn Hazlewood
- Sarrah Marcotte
- Jennifer Thompson
- Fayeza Ahmed

1068. Sentinel Spectroscopy: Light-Surface Interactions for the Continuous Detection of Chemical Composition in Space Agriculture Runoff - Withdrawn From Judging

- Christopher Erb
- Liza White
- RJ Perry
- Caitlin Howell

1069. A Model to Study the Direct Effects of β 2-Adrenergic Receptor on Osteoclasts

- Rebecca Peters
- Audrie Langlais
- Ryan Neilson
- Katherine Motyl

1070. *Mycobacterium chelonae* Prophage ProphiMSKB1-4: Armed and Prepared to Translate - **Withdrawn From Judging**

- Abigail McNally
- Sally Molloy

1071. The Effects of Antifungals on *Candida albicans* growth in the presence of Group B Streptococcus

- Anna Lane
- Kathryn Patenaude
- Melody Neely

1072. Withdrawn From Judging

1073. Reusable Cloud-Based Bioinformatics Analysis Environments to Enhance Data Science

- Steven Allers
- Benjamin King

1074. Low Dose Arsenic Exposure and miR-199 Dysregulation Alters the Innate Immune Response to *Pseudomonas aeruginosa* Infection in Zebrafish.

- Liz Saavedra
- Brandy Soos
- Carol Kim
- Benjamin L. King

1075. Alkaline Phosphatase Deficiency Leads to Decreases in Adipogenesis and Mitochondrial Function

- Victoria DeMambro
- Samantha Costa
- Jennifer Daruzska
- Clifford Rosen
- Anyonya Guntur

1076. Altered Patient Metabolomic and Inflammatory Transcriptomics After Fasting and High Calorie Diet in Bone Marrow Adipocytes

- Samantha Costa
- Gisela Pachón-Peña
- Julie Dragon
- Scott Tighe
- Calvin Vary
- Heather Campbell
- Clifford Rosen

1077. Role of Non-Coding RNAs in Adaptation to Environmental Stressors Through the Study of Natural Populations

- Kayla Barton
- Adrienne Kovach
- Brian Olsen
- Benjamin King

1078. GPCR-directed Septin Structures Are Mediated by Cdc42 GAPs and Epsins - Withdrawn From Judging

- Cory Johnson
- Andrew Hart
- Sarah G. Latario
- Joshua B. Kelley

1079. Defining the Role of RAB27a in Vascular Contractility

- Ashley Soucy
- Anne Harrington
- Larisa Ryzhova
- Benjamin Tero
- Abby Kaija
- Lucy Liaw

1080. An Overview of Three Biomedical Science Projects across Three Research Institutes

- Lola Holcomb
- Jim Coffman
- Ben Harrison
- Kerry Tucker
- Sue Ishaq

1081. The TAp63-dependent and -independent DNA Damage Response in Meiotically Arrested Oocytes

- Monique Mills
- Chihiro Emori
- Zachary Boucher
- Ewelina Bolcun-Filas

1082. Design of Neutrophil-Specific Fluorescent Reporter Constructs for Ncf1 and Nfe2l2 to Characterize The Production of Reactive Oxygen Species During Influenza Virus Infection in Zebrafish

- Samuel Weafer
- Brandy-Lee Soos

• Benjamin King

1083. Fickle Finkle: One of a Kind - Withdrawn From Judging

- Sydney Brown
- Seth Ashby
- Gavin Bressette
- Sophie Charles
- Melody Neely

1084. Perivascular Adipose Tissue is Distinct in Two Disease Populations

- Caitlin Stieber
- Lucy Liaw

1085. Investigating the Interaction of *Streptococcus agalactiae* and *Candida albicans* in Vitro and in Vivo

- Kathryn Patenaude
- Anna Lane
- Robert T. Wheeler
- Melody N. Neely

1086. Anti-Inflammatory Effect(s) of Phenolic Extract from Wild Blueberries in Wound Healing

- Tolu Esther Adekeye
- Natalie VandenAkker
- Tyla Greenlaw
- Dorothy Klimis-Zacas

1087. Rapgef Family Members Contribute To Erk Activation by Gs-coupled Receptors In Mouse Dorsal Root Ganglion Neurons

- Zaid Al-Abbasi
- Derek Molliver
- Ramaz Geguchadze

1088. NOD/ShiLtJ Strain: A Mouse Model to Investigate the Regulation of Fetal Oocyte Attrition.

- Rose Besen-McNally
- Ruby Boateng
- Nathaniel Boechat
- Ewelina Bolcun-Filas

1089. Uncovering Candida albicans Factors that Modulate the Host Phagocyte Response

- Bailey Blair
- Emma Bragdon
- Robert Wheeler

1090. Combining Regional Cell Composition Estimates with Bulk RNA Sequencing Allows for Refined Detection of Cell-Type-Specific Genetic Associations

- Brianna Gurdon
- Niran Hadad
- Maria Telpoukhovskaia
- Sharon Yates
- Jan Bjaalie
- Catherine Kaczorowski

1091. Influenza A Virus Infections Measured by Respiratory Burst Assay

- Brandy-Lee A. Soos
- Alec Ballinger
- Mykayla Weinstein
- Benjamin L. King

1092. Characterization of the Polymorphic Toxin System in Mycobacterium Prophage McProf

- Xuyang Gu
- Sarah McCallister
- Jaycee Cushman
- Anna Schumann
- Sally Molloy

1093. Toxicity of Lanthanide Series Rare Earth Elements in Caenorhabditis elegans

- Michael Croft
- Jennifer Newell-Caito

1094. Screen to Find Regulators of *Candida albicans* Drug Tolerance During Co-cultures with *Pseudomonas aeruginosa*

- Nikhil Vaidya
- Siham Hattab
- Robert T. Wheeler

1095. Investigating the Sexually Dimorphic Role of Corticotropin-Releasing Hormone in Neonatal Trauma-Induced Pain-Vulnerability

- Megan Tomasch
- Mike Burman

1096. Integrating Molecular Profiles with Clinical Outcomes in Cancer Patients from Rural Maine

- Michael Babcock
- Benjamin King

1097. Integrin and Dystroglycan Protein Localization in Muscle Cell Membranes in Dystroglycan and Dystroglycanopathy Mutants

- Mary Astumian
- Prakash Raut
- Clarissa Henry

1098. Veterinary Immersion Network

- Zachary Inniss
- Anne Lichtenwalner

1099. CTHRC1 Suppresses Adipogenesis and Modulates Lipid Composition

• Matthew Siviski

• Igor Prudovsky

1100. Notch Signaling Regulates PVAT Function During Diet-induced Obesity

- Chenhao Yang
- Anne E. Harrington
- Larisa M. Ryzhova
- Lucy Liaw

1101. Electrophysiological Recordings in Humans Using a Novel Microneedle Array Device - **Withdrawn From Judging**

- Lydia Caron
- Sarrah Marcotte
- Leonard Kass
- Rosemary Smith
- Magdalena Blaskiewicz
- Kristy Townsend

1102. Bone Regeneration: Cellulose Nanofibers and Additional Composites - Withdrawn From Judging

- Shanna Scribner
- Sahar Roozbahani
- Michael Mason

1103. Determining Septin localization With α -Arrestin Deleted Strains of *Saccharomyces cerevisiae*

- Ryan Andrick
- Joshua Kelley

1104. Phenolic Extract(s) from Wild Blueberries promotes Wound Re-epithelialization

- Tolu Esther Adekeye
- Natalie VandenAkker
- Loryn Porter
- Dorothy Klimis-Zacas

1105. Effects of Binge-Eating on Impulsivity, Compulsivity, and Reward Sensitivity Across Strain and Sex

- Logan Douglas
- Kristen O'Connell

1106. Gordonia Phage Periwinkle - Withdrawn From Judging

- Abigail Dichiara
- Emma Boudreaux
- Sophie Childs
- Amy Handy
- Sam Kovacs
- Alison Kueck
- Parker Landsbergen
- Sally Molloy

1107. Novel Cluster CZ phage Oregano: Friend & Foe to Bacteria - Withdrawn From Judging

- Alexander Russell
- Veronica Chun
- Oyku Goktug
- Hannah Lembree
- Dorian Royal
- Annika Savage
- Makayla Sisco
- Maple Waltner
- Sally Molloy

Physical and Mathematical Sciences

101. Design, Construction, and Investigation of a Small Polarimeter

Submission Type: Poster

Submission Category: Physical and Mathematical Sciences

Author(s):

Kelvy Zucca David Batuski

Faculty Mentor: David Batuski

Abstract: This project uses a custom polarimeter to measure the polarization of light we receive from stars. Most bright stars emit unpolarized radiation, so measuring non-zero polarization is significant. Even highly polarized stars only have polarizations around five percent. Polarized light from a star may mean 1) the star is actually a binary system, 2) the star has a significant magnetic field, or 3) the star has some other feature or variability that is atypical of the majority of bright stars. A polarimeter is used to measure polarization. As the Jordan Observatory did not have a polarimeter, the project began by designing and constructing an instrument to suit our purposes. The polarimeter needed to be small enough to fit unobtrusively on the telescope and have the precision necessary to measure stellar polarization. The polarimeter was designed, and parts were ordered for its construction. Once constructed, the polarimeter was used to collect data on a number of stars and other celestial objects. Code was written to work with the polarimeter. This code calculated polarization using the intensities of images taken at different orientations of the instrument. Stars with known negligible polarization and stars with known high polarizations were used to calibrate the polarimeter for any instrument polarization and check its accuracy. Then, stars with lesser known but still likely high polarizations were targeted. A few non-stellar objects were also targeted to test the capacity of the polarimeter. The polarimeter was paired with two different cameras to investigate their effect on instrument performance.

102. Isolation and Analysis of Glycosaminoglycans (GAGs) Using TEAB Auxiliary

Submission Type: Poster

Submission Category: Physical and Mathematical Sciences

Author(s):

Jinyoung Park Matthew Brichacek

Faculty Mentor: Matthew Brichacek

Abstract: Glycosaminoglycans (GAGs) are involved in biological processes such as stem cell differentiation, migration, and infections. GAGs serve a significant role in influencing the attachment and transmission of harmful pathogens in biological hosts. The current processes of isolating GAGs are challenging and inefficient due to the complexity in their structure. In this study, glycan auxiliary 2-thio(N-aminoethyl)benzamide (TEAB) auxiliary was synthesized (75% yield) and conjugated to natural hyaluronate (hyaluronic acid) polymers. The hyaluronic acid polymers were shortened using acid hydrolysis, conjugated with the TEAB-Zn auxiliary through reductive amination, and fractionated by size. The conjugated hyaluronic acid was analyzed by 1H NMR. From the analysis of the 100-hour aliquot, 97.2 mg of conjugated HA product was obtained, which contained an average of 24 HA units attached to the TEAB-Zn. The functionalized GAGs were then attached to a glass microscope slide (biological array) for further in-depth analysis.

103. Effect of Reducing Agent on Water-Stable Gold-aryl Nanoparticles

Submission Type: Poster

Submission Category: Physical and Mathematical Sciences

Author(s):

Everett Zuras Ahmad Ahmad Mitchell Bruce Alice Bruce

Faculty Mentor: Alice Bruce

Abstract: Metal nanoparticles are of interest to the scientific community for their unique physical and chemical properties. Gold-aryl nanoparticles (AuNPs-COOH) exhibit high catalytic activity due to their high surface-to-volume ratio. AuNPs-COOH are synthesized by the reduction of aryldiazonium gold(III) salts using a mild reducing agent such as sodium borohydride or 9-BBN in aqueous solution. This work focuses on the effect of the reducing agent on the size, properties, and catalytic ability of AuNPs-COOH. Varying the choice and the amount of reducing agent used in the preparation of AuNPs-COOH has been shown to have an inverse correlation with the size and a direct correlation with apparent rate constant (k app) in the reduction of 4-nitrophenol (4-NPh) with NaBH 4 catalyzed by AuNPs-COOH. UV-Vis spectroscopy is used for both the estimation of nanoparticle size, and to follow the reduction of 4-NPh. IR spectroscopy is used to provide understanding as to the nature of the organic shell.

104. Examining the Impact of Question Order on Student Performance on Qualitative Physics Questions

Submission Type: Poster

Submission Category: Physical and Mathematical Sciences

Author(s):

Jaymie Pratl MacKenzie Stetzer

Faculty Mentor: MacKenzie Stetzer

Abstract: The order in which introductory-level physics review questions are presented to college students may affect their ability to engage in productive reasoning leading to the correct answer. In certain cases, the inclusion of a cueing question may potentially enhance student performance by providing a guide toward the appropriate problem-solving technique. Dual-process theories of reasoning suggest that order may not matter in other cases. Two question sequences were administered to introductory, calculus-based physics students on online participation-based homework assignments. The sequences were focused on the effects of frictional forces and on the concept of a closed-loop circuit. The question sets consisted of two multiple-choice questions and two short answer explanation fields, in which students provided explanations of their thought processes. The question order was randomized in a manner that some students viewed the cueing question first while others received the target question. If the sequences functioned as intended, it was hypothesized that students who viewed the cueing question first would be more likely to produce a correct answer on the target question, and students who received the target question first would be more likely to alter their original answer when given an opportunity to reflect on the consistency of their reasoning. Insight into the extent to which question sequencing may impact student performance may guide the development of instructional materials that target student reasoning.

Business

201. Measuring China's Footprint in the United States

Submission Type: Exhibit

Submission Category: Business

Author(s):

Nicholas Johnson Stefano Tijerina

Faculty Mentor: Stefano Tijerina

Abstract: We measured FDI (Foreign Direct Investment) in the United States from Mainland China, Taiwan, and Hong Kong. Our research establishes patterns in the FDI that determine what industries the regions are focused on establishing in the United States, how much stock they have accumulated, and the impact that their investments have at the local level in states like Maine, Alabama, and California. Amongst the three regions, we compiled data from sources such as the Bureau of Economic Analysis, and China's Ministry of Commerce to examine \$68.29 billion of FDI stock across sectors such as manufacturing, trade, real estate, finance, and determined what the fair value of these investments is. We used data from China's Ministry of commerce to determine where the United States ranked as a recipient of China's FDI outflows and stock. Results showed that the United States was one of the top five destinations for China's FDI, but received less from Mainland China than the Cayman Islands and the British Virgin Islands, and less from Hong Kong than Bermuda, Singapore, the Cayman Islands, and the British Virgin Islands. Hong Kong and Mainland China sent a combined \$7.35 billion into the United States in 2020, while they sent \$58.73 billion to Bermuda, the Cayman Islands, and the British Virgin Islands. Further studies could examine more closely the FDI flows to Bermuda, the Cayman Islands, and the British Virgin Islands as these are popular locations for shell companies, which could mean that the FDI totals are artificially lowered.
202. Expanding Maine's Blue Economy through Aquaculture Business in Maine

Submission Type: Poster Submission Category: Business

Author(s):

Giselle Sillsby Christain Brayden Caroline Noblet

Faculty Mentor: Caroline Noblet

Abstract: Aquaculture offers an opportunity to provide sustainable seafood and contribute to Maine's economic growth. The rapid growth of aquaculture in Maine has led to a need for information on how aquaculture businesses have responded to the increased demand for their products and their plans for expansion, distribution, and promotion of their product. This study uses data from a February 2022 survey of Maine Aquaculture businesses collaborating with the Maine Aquaculture Association. We document priorities for industry growth, struggles, and lessons learned by Maine aquaculturists.

We explore the Maine aquaculture industry's current and planned distribution methods, product promotion, and expansion plans. Importantly, this work provides a snapshot of the industry after the impact of COVID-19 on food products, including plans to expand Maine's aquaculture product sales locally, in-state, and beyond.

203. NIL Legislation and Sponsorship of D1 NCAA Athletes

Submission Type: Exhibit

Submission Category: Business

Author(s):

Thomas Erick Connor Blake Norm O'Reilly

Faculty Mentor: Norm O'Reilly

Abstract: Name, Image, and Likeness (NIL) all equate to the three components that an individual can leverage to profit off themselves. National Collegiate Athletic Association (NCAA) student-athletes however had not been able to leverage their NIL due to a policy by the NCAA which prohibits players from being paid to play (NCAA, 2021). On June 21st, 2021 the Supreme Court of the United States ruled against the NCAA in the NCAA v. Alston case, which allowed players to receive compensation related to their NIL.

In response to this ruling on June 30th, 2021, the NCAA put out a statement changing their policy on NIL stating the following "The NCAA is committed to allowing name, image, and likeness opportunities for student-athletes consistent with the college athlete model." (NCAA, 2021). This rule change means that a new population of individuals within society can now leverage their NIL to profit. Therefore, this study attempts to explore the topic area (the positives and negatives) from the perspective of student-athletes.

To better understand the effects of NIL, the research team is employing a sequential focus group method followed up by a survey. The focus group would be conducted with University of Maine student-athletes. Data from these focus groups would then be analyzed and ultimately a survey created that will be used to better understand how NIL is impacting NCAA Division I athletes at other institutions.

Education

301. Creating a Healthy Rural Ecosystem for Community Vitality: Developing Rural Business Research

Submission Type: Virtual Presentation Submission Category: Education

Author(s):

Nicole LaPlant Karalyn Kutzer Emily Newell Kathleen Gillon Eklou Amendah Jamahl Williams Catharine Biddle

Faculty Mentor: Catharine Biddle

Abstract: The objective of this project is to create a model of and mechanism for statewide, systematic data collection to support workforce development pathways for P-20 students in rural Maine to ensure the long-term vitality and success of these communities. Educational systems serve as the starting point of the creation of qualified workers for local business. However, data is not currently made available to school systems or businesses and community leaders that would allow them to make thoughtful decisions about how to use community resources and time in order to create these partnerships. The development of the community is intrinsically linked to the educational system and the opportunities it provides. Without qualified and educated workers businesses, and as a result towns cannot thrive (Bird, Sapp, & Lee, 2001; Schafft, 2016; Tigges & Green, 1994). Despite challenges in providing quality education in addition to business opportunities, these communities still have the potential to be successful in the long-term. Through a series of semi-structured interviews with educators in two rural Maine communities the researchers will utilize their preliminary research to gain a deeper understanding of the towns

and collect data through the interviews in order to aid the development of the educational systems and their partnerships with businesses in rural communities to allow for economic development.

302. Increasing Communication Opportunities in the Classroom Using Augmentative and Alternative Communication (AAC): A Systematic Literature Review

Submission Type: Exhibit Submission Category: Education

Author(s):

Emma Budway Cameryn Long Lauren Page Deborah Rooks-Ellis

Faculty Mentor: Deborah Rooks-Ellis

Abstract: Supporting children with complex communication needs requires adequate training on augmentative and alternative communication (AAC) systems and providing ample opportunities for social interaction. This systematic literature review examines the benefits of AAC use in classroom settings and the optimal time to introduce aided or unaided systems. Key findings demonstrate benefits of AAC ranging from increased social closeness, participation in everyday contexts, and expressive language. AAC in the classroom with peer support has been shown to increase social interaction and overall use of AAC systems. Studies have found that 44.2%-71% of educators do not have sufficient training to support their students' communication needs. The purpose of this review is to provide insight into parent, clinician, and educator understanding of AAC use and its benefits to children's communication. This review is exploratory in nature and is limited by the available literature on the topic. Future research trajectories are also discussed, including cultural competence of AAC systems.

303. The Crypto Nest

Submission Type: Virtual Presentation Submission Category: Education

Author(s):

Tyler Layton Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: Tyler is looking to create a learning platform that is so easy to understand your grandma can learn from it. Tyler has noticed the difficulty of learning about cryptocurrencies and Non-Fungible Tokens (NFT's) online; most of the information listed actually makes people more confused. Tyler aims to make a platform that teaches users the ins and outs of Crypto/ NFT's so they can form their own opinions on the subjects. The first step is to make a website that has all the learning information listed, then transition to other platforms to further connect with the users.

304. The Study of Adult Learners in Distance Education: A Scoping Review of the Literature

Submission Type: Virtual Presentation Submission Category: Education

Author(s):

Anne Fensie Teri St. Pierre J. Meryl Krieger Melissa K. Jones Megan R. Alicea Katrina Wehr Aubrey Rogowski Karen Bellnier Sharon Flynn Stidham Parm K. Gill Linda Wiley Aoife O'Mahony Elizabeth Allan

Faculty Mentor: Elizabeth Allan

Abstract: Understanding the research about adult learners is key to impacting their success, however, a systematic review of the literature about the learning process of adult learners in distance education settings could not be found. Given this gap, the goal of this research is to (1) map the current state of empirical and analytical research on adult learning in distance education; (2) identify gaps in the literature and directions for future research, (3) synthesize definitions, and (4) organize concepts and literature for other researchers and practitioners. An interdisciplinary and inter-institutional team of 16 researchers located 20, 241 possible abstracts for review and is undergoing several rounds of analysis to identify articles that meet inclusion

criteria outlined in the study protocol. The online tools Abstrackr and Covidence are used to facilitate this process. Using a coding tool, articles will be indexed to answer the following research questions: (1) What are the characteristics of studies on adult learning in distance education? (2) What research methods were employed to study adult learning in distance education? (3) What did the analyses of adult learning in distance education reveal?

Allied Health

401. Family Nurse Practitioner Student Perceptions of Simulation Based Education

Submission Type: Virtual Presentation

Submission Category: Allied Health

Author(s):

Sean Sibley Kelley Strout

Faculty Mentor: Kelley Strout

Abstract: A form of high fidelity simulation, known as Objective Structured Clinical Examination (OSCE), is an evidence-based teaching/learning tool. Students prepare for and perform specific learning outcomes within the clinical scenario. There is substantial published literature and consensus guidance on simulation in pre-licensure nursing programs, but a lack of research on simulation in graduate level nursing education. The University of Maine School of Nursing graduate program has been developing and implementing theory and evidence based OSCE simulations in the FNP program since 2020. The simulation experiences are embedded into Family Nurse Practitioner (FNP) courses. Simulation is a form of experiential learning when students have the opportunity to "do it" and then reflect on the experience with evidence guided debriefing with faculty. Therefore, student satisfaction and perceptions of the design may influence their learning through the student-centric lens of experiential learning. Using three psychometrically sound standardized surveys, this study evaluates UMaine FNP students' perceived satisfaction and self-confidence with the OSCE experience, as well as their evaluation of the simulation design, and how OSCEs attend to their learning needs. The sample was taken from FNP students in their final semester of the program, all of whom are registered nurses pursuing a Master of Science degree and certification as a Family Nurse Practitioner. Data is being collected and analyzed in March 2022 with outcomes to be determined.

402. Climate Change Affects Wild Mammal Ranges and Health; Will That Also Affect Infectious Disease Exposure Risk at Maine Farms?

Submission Type: Poster Submission Category: Allied Health

Author(s):

Rebecca French Joseph Beale Suzanne Ishaq

Faculty Mentor: Suzanne Ishaq

Abstract: Climate change has caused the migration of animal species to new environments that match their ideal climate for living, but this introduction of species also allows new microbial pathogens to infest new environments. This has been seen recently in New England concerning Southern Flying Squirrels (Glaucomys volans) and in many species of mice including a vector for Lyme disease; White-footed Mice (Peromyscus leucopus). The research question that was investigated was if the integration of new species of rodents into Maine is bringing a risk of pathogenic outbreak into both livestock and human populations. The hypothesis posed was that pathogens such as Strongyloides robustus, Escherichia coli, Salmonella enterica, and others are going to be seen in samples taken from captured mice and squirrels. Pathogens and microbes were observed from samples of feces from caught rodents, at both farms and neighboring wilderness from multiple sites around Maine. These samples were then diluted and cultured on either Eosin Methylene Blue (EMB) agar, MacConkey agar, Blood agar, or Brilliant Green agar. Fecal flotations were also performed to look for parasites and eggs. The results of this project were inconclusive due to the difficulty in capturing many rodents. The hypothesis in turn was neither correct nor incorrect; because no conclusion could be made with such a small sample size. The direction of the research pivoted more toward the revision of methods and locations of future investigation so that in the future better results can be found. A large focus of the project also became training students in interdisciplinary research, so that these students could help to move this project forward in the future. This view of study has a great impact as it is demonstrating another risk of allowing climate change to progress throughout the world, and that is what makes it so important for more students to research this in the coming years.

403. Firefighter Cancer Risk: A Qualitative Study of the Current Perceptions and Practices Surrounding Cancer Prevention in the Fire Service in Maine

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Lauren Jellison

Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: Problem Statement: Cancer is becoming a common concern in the fire service. Studies have shown that firefighters are 14% more likely to be diagnosed with cancer compared to the general population. Firefighters have exposures to elements the public does not. Prolonged exposure to carcinogens may lead to an increased risk of firefighters' poor health and safety outcomes. These exposures can occur on incident scenes and in department stations. Perceptions of firefighters have been studied to look at the main concerns surrounding cancer exposure and what can be done to decrease risk. The purpose of this study is to examine the perceptions of members of the Professional Fire Fighters of Maine (PFFM) and Maine Fire Chiefs surrounding cancer in the fire service and identify ways that cancer screenings can be better implemented. Methods: Two surveys (one for PFFM and one for the Maine Fire Chiefs) have been developed targeting both groups' perceptions of cancer risk in firefighters and the tactics departments and firefighters in Maine are taking to mitigate those risks.

Conclusion: Data will be analyzed from both surveys using descriptive statistics and compared to each other to gather information about the two parties' perspectives. Once the data is analyzed, educational sessions for both the Professional Fire Fighters of Maine and the Maine Fire Chiefs Association are planned to present the data collected.

404. The Future of Nursing: Supporting Student Success

Submission Type: Poster Submission Category: Allied Health Author(s): Rebecca Dias

Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: There is a critical nursing shortage in Maine and throughout the country. The COVID-19 pandemic has exacerbated this shortage and led to nurse burnout and exit from the healthcare field. To supplement the nursing workforce, and meet accreditation requirements, universities are tasked with graduating high percentages of qualified nursing students. Many studies have addressed techniques to improve nursing student retention rates, yet attrition remains high. Utilizing a structured literature review, evidence-based methods of supporting nursing students during four-year programs were compiled. These interventions fell into broad categories including social support, academic support, general academic skills, and the transition to higher education. Included among necessary social supports are strong peer relationships and financial security; academic supports include early intervention for failure risk, advising, and multi-disciplinary referrals. Enhancing academic skills including study techniques, time management, and test taking have been linked to improved student retention; bridging the gap between secondary and higher education with immersive orientations and individualized contact from faculty prior to the start of the first semester have led to improved student outcomes. Utilizing these interventions, an action plan was constructed to facilitate timely graduation of the nursing classes at the University of Maine. This action plan acts as an inter-departmental support system for students, as well as a comprehensive blueprint and referral network for faculty, including the First Year and Transfer Center, LiveWell, the Student Wellness Resource Center, and the counseling center.

405. Utilization of Telemental Health Services in Rural Communities

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Lydia Sprague Samantha Mills Jessica Rolfe Tracey Peterson Kelly Strout

Faculty Mentor: Kelly Strout

Abstract: In addressing the potential role telehealth can have on the utilization of mental health services by patients residing in rural areas, we ask the following evidence-based PICOT question: Do patients residing in rural areas with access to telehealth utilize mental health services more often than those without access to telehealth? The COVID-19 pandemic has brought many challenges to the forefront of healthcare in addition to new innovations to combat these arising problems. Telehealth has been utilized to provide efficient and effective mental health care to patients who otherwise would not have been able to receive these required services. We conducted the search for research articles within Google Scholar and CINAHL using the terms and phrases "telehealth," "rural communities," and "mental health services." Search criteria required all research articles to have been published between 2017 and 2022. All articles within this review were required to address all three keywords / phrases used in the search. Articles that did not discuss the use of tele-mental health services in rural communities were excluded. Sixteen articles were chosen that fell within the search criteria. Research suggests continued utilization of telehealth in combination with face-to-face meetings post-pandemic to increase the access to and utilization of needed mental health services in rural and underserved areas in the United States and around the globe.

406. Depressive Mood and Tobacco Use in Association with Cardiovascular Health

Submission Type: Poster Submission Category: Allied Health

Author(s):

Kelsey Apovian Michael Robbins

Faculty Mentor: Michael Robbins

Abstract: The Centers for Disease Control and Prevention (CDC) have identified heart disease as the leading cause of death in the United States of America. According to the American Heart Association one of the indicators of heart disease is depressive symptoms experienced over a period of time. Another major risk factor for heart disease prevalence is tobacco use, which, in turn, the CDC has reported is more common for individuals with depression and anxiety. This study focuses on the association of depressive symptoms and tobacco use with cardiovascular health, while also examining additional lifestyle factors that contribute to the high rates of heart disease in America. It was hypothesized that use of tobacco as well as presence of depressive symptoms would negatively impact cardiovascular health. Cross sectional analyses were conducted with a sample of 893 participants aged 50 years or older from wave 6 of the Maine-Syracuse Longitudinal Study (MSLS), which included measures of depressive symptoms, trait anxiety, tobacco use, prescription psychotropic medication and cardiovascular health. Results thus far indicate that individuals who formerly smoked or currently smoke tobacco have higher trait anxiety scores and use of psychotropic medication than individuals who never smoked. Former smokers reported the highest number of symptoms of depression. Initial analyses show that more symptoms of depression are associated with poorer cardiovascular health, but results for tobacco use groups are mixed. Further analyses will examine tobacco use groups, depressive symptoms, psychotropic medication, and other lifestyle risk factors in relation to cardiovascular disease outcomes.

407. The Prevention of Necrotizing Enterocolitis Through the Fortification of Human Milk

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Kate Ciesielski Nicholas Powers Emma Heiser Sara Todd Kelley Strout

Faculty Mentor: Kelley Strout

Abstract: Necrotizing enterocolitis (NEC) is the most common inflammatory disease of the gastrointestinal tract affecting preterm neonates which can rapidly progress to necrosis and possible perforation leading to increased healthcare costs, increased hospital length of stay, high mortality rates, and long term developmental and gastrointestinal issues. When looking into ways to combat this disease process found in preterm infants, human breast milk (HBM) is the first line of defense. HBM supplies infants with astonishing anti-infective properties and creates a variety of benefits for preterm infants in relation to gut health. The purpose of this literature review was to explore the fortification of human milk (HM) and how it affects the incidence of NEC. Literature reviewed is unanimously in support of a human milk diet because it helps to strengthen the gut microbiome. Bacteria located in the gut play a major role in immune homeostasis. For this research, we used the CINHAL database as well as Google Scholar. Based on our keywords below, we found twenty articles and narrowed our selection to twelve peer-reviewed articles. We have included articles published within the last five years, except for one significant publication. Our literature review shows fortifying infant feedings provides essential nutrients that can help promote neonatal gut health which reduces the risk of NEC. For future nursing care, health care teams should focus on educating caregivers about the importance of these preventative measures to produce the best outcome.

408. Addressing Human Sex Trafficking in Primary Care

Submission Type: Poster Submission Category: Allied Health

Author(s):

Chloe White Mary Tedesco-Schneck

Faculty Mentor: Mary Tedesco-Schneck

Abstract: Human sex trafficking is a growing public health crisis with a significant presence globally and within the United States. Known to be underrecognized and underreported, the true prevalence of sex trafficking victimization is unknown but is believed to be high. Survivors of sex trafficking suffer immediate and long-term physical, mental, and social consequences. There are well-researched risk factors that raise the likelihood of victimization by human sex trafficking. It has been reported that the majority of sex trafficking victims do access healthcare while being trafficked. For numerous reasons, victims are unlikely to freely disclose their status to healthcare providers or other figures of authority. Each interaction a victim has with a healthcare provider is an opportunity to be recognized and assisted. However, research data and survivor narratives suggest opportunities for recognition are often missed. Primary care family nurse practitioners, who place value in long-term relationships with their patients, are in a position to assess patients for sex trafficking risk factors and initiate preventative care. They are also in the position to identify patients who are victims of sex trafficking and to assist them in accessing services. There is a lack of education for healthcare providers regarding these crucial skills. A discussion of risk factors for sex trafficking and preventive strategies for those at risk, as well as a brief overview of the response to suspected victim identification, is the focus of this discussion.

409. Assessing the Impact of a Statewide Oral Health Education Program in Long-Term Care

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Rachel Coleman David Wihry Leah Kravette Jennifer Crittenden

Faculty Mentor: Jennifer Crittenden

Abstract: Older adults who need assistance with oral health care are at risk of poor oral health which impacts their overall health outcomes. Health professionals in long-term care facilities often need to assist older adults with their oral health; however, oral health training and education related to older adults is limited in long-term care settings.

MOTIVATE (Maine's Oral Team-Based Initiative: Vital Access to Education) provided over 700 staff at eight long-term care settings free education and technical assistance to advance their knowledge, skills and attitudes about oral health based on the training needs identified through a pre-program survey.

Staff knowledge and attitudes related to older adult oral health care were assessed via survey before, during, and after MOTIVATE training. Program implementation applications and barriers were gathered after MOTIVATE completion. Resident and family member satisfaction with oral care provision was gathered via survey and the eight sites provided resident metrics related to oral health where available.

Following training, staff reported high levels of positive attitudes towards the importance of older adult oral healthcare and use of MOTIVATE oral healthcare techniques with residents. Staff reported older adult oral health care knowledge increased (88.1%-99.0% pre/post knowledge scores) and all eight sites implemented enhanced oral health assessments at admission and follow-up intervals. 1,700 MOTIVATE oral health kits containing oral hygiene

tools were distributed and the average number of residents with oral health care plans dramatically increased within the two sites that tracked this metric (from 24 to 158 plans).

410. Music Therapy as Pain Management for Postoperative Adult Patients

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Paige Madore Alysa Villapa Danny Kornsey Kaitlyn Sutton Kelley Strout

Faculty Mentor: Kelley Strout

Abstract: In postoperative adult patients who have undergone major surgery, does music therapy (MT) in combination with pharmaceutical pain management compared to use of only pharmaceutical pain management, produce lower pain scores? Patients who experience pain postoperatively are often treated with a "one-size fits all" pain medication regimen that doesn't work for every patient. The purpose is to determine if pharmaceutical pain management combined with MT is a more effective intervention for postoperative pain. This project examines results from multiple evidence-based articles to help support that MT can be an effective form of pain management for postoperative adult patients. The articles showed clinically significant reduction in pain and the need for analgesia when clients utilized MT postoperatively. Studies also determined the implementation of MT into practice to be low-cost and feasible for postoperative pain. Upon review of the literature, integration of MT decreases pain in adults postoperatively following major surgery. We recommend nurses advocate the use of this intervention to patients who are willing to combine MT with pharmaceutical pain management. Further research is needed to determine which types of music are most effective in reducing pain.

411. Exploring Teaching Methods on the Topics of Leadership to Undergraduate Nursing Students

Submission Type: Virtual Presentation

Submission Category: Allied Health

Author(s):

Sarah Sinclair

Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: As the nurse's role has changed over time, the need for nurses to possess leadership skills is vital for the growth and development of the healthcare system as a whole. With the demand for these skills, multiple national and state organizations have required leadership in undergraduate nursing programs. This requirement then trickles down to the colleges and universities producing and educating the nurses of the future. Undergraduate nursing educators must rise to the task of adequately teaching our undergraduate nurses leadership skills to carry to their professional careers. There are multiple teaching methods for students, and they are constantly changing as the generations of learners change. These methods include lecture-based, flipped classrooms, team-based learning, and laboratory and clinical experiences. It is essential to evaluate these methods based on the content being taught. A literature review was conducted to determine the methods of teaching undergraduate nursing students and the results of each technique. Overall, alternative teaching methods had positive results, increasing student satisfaction, confidence, knowledge, teamwork, and engagement. Of the alternative methods, gaming was isolated and tested on senior undergraduate nursing students. An escape room was developed to replace the student's traditional hands-on skills day. The intended outcomes demonstrated on post-activity surveying are that students will experience increased competence of skills, teamwork, collaboration, and leadership.

412. The Effectiveness of Electronic Hand Hygiene Compliance Monitoring Systems in Healthcare Settings

Submission Type: Poster Submission Category: Allied Health

Author(s):

Courtney Callanan Keyana Miller Lynsie Russell Kelley Strout

Faculty Mentor: Kelley Strout

Abstract: Hand hygiene (HH) is an essential part of nursing practice. Although the importance of HH compliance is emphasized in all healthcare settings, it is still being performed inadequately. Using effective HH measures is associated with decreasing the risk for healthcare-associated infections (HAIs). The significance of this problem involves general patient safety but also the cost and burden of these infections on the healthcare system. Furthermore; in hospitalized patients, how will electronic hand hygiene monitoring systems (EHHMS) for healthcare workers decrease the rate of HAIs compared to no implementation of a monitoring system?

The aim of this presentation is to determine how implementing EHHMS affects HH compliance. We found EHHMS come in different forms based on what is appropriate for the facility's infrastructure. Research showed that the gold standard of HH compliance is human observation. EHHMS are more accurate for monitoring HH compliance as it continuously monitors healthcare workers. Our research found a direct correlation between adequate HH compliance and preventing HAIs. Success of these systems relies on recognition and accountability of an organization combined with instant feedback and visual data within weekly compliance reports.

To determine HH compliance status among healthcare systems, 13 articles were referenced. Searches were conducted using databases including CINAHL and Nursing Reference Center Plus. Searches were limited to peer-reviewed articles published within the last 5 years. Research recommends hospital leadership incorporate nurses into the conversation about EHHMS. This can be done through leading by example and feedback from compliance reports to nursing supervisors from each unit.

413. For New Graduate Nurses, How Does a Nurse Education Program Addressing Coping Skills For Work-Related Stress Impact Job Satisfaction, Retention Rates, and Reduce Nurse Desensitization?

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Hannah McAlary Jackie Kucia Chrissy Skidgel Anna Badstubner

Faculty Mentor: Kelley Strout

Abstract: This evidenced based study analyzed the impact of nursing education programs for new graduate nurses in regard to job satisfaction, retention rates, and desensitization. The research is aimed to address coping skills and prevention strategies used to combat work-related stress in nurses in comparison to the effects of new graduates' experience when no such intervention has been applied. The incidence of burnout in the nursing profession has grown as a result of high stress levels, staffing shortages, and unsupportive workplace environments catalyzed by the COVID-19 pandemic. The CINAHL database from the University of Maine Fogler library website was used to search evidenced based articles relating to how nurse education programs address coping skills for work-related stress impact job satisfaction, retention rates, and reduce nurse desensitization. To gather our data, key words and phrases were searched in relation to the subject. These included: nurse burnout, stress management, coping skills, nurse education programs, and job satisfaction. All resources were evidenced based and peer reviewed articles published within the last five years. Through our research we discovered that mindfulness based stress reduction interventions, simulation based practice programs & peer coaching are all successful strategies in mitigating stressors. The goal of this evidenced based research is to improve the quality of life for nursing professionals and overall efficacy of the healthcare system. It is recommended that nurses advocate for their own mental health and that employers provide evidence-based resources discussed within our research to reduce the incidence of stress and burnout in new nurses.

414. Structured Stress Relief Programs on Reducing Compassion Fatigue in Palliative Nursing

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Lily Jennings Jordyn Gowell Rachel Miller-Treat Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: PICO Question:

In nurses working in palliative care, does structured stress relief programs, compared to attempted self implemented interventions, lead to decreased rates of compassion fatigue?

Topic and Purpose:

The compassion fatigue palliative nurses face daily is a prevalent issue in hospitals and hospices alike. Nursing suicide statistics show an annual average that is double that of the general population, while also facing higher rates of depression. With moral distress and adversity on the rise in healthcare facilities, considerations must be implemented to reduce nursing stress. The purpose of this literature review is to determine interventions shown to best decrease the compassion fatigue palliative nurses endure.

Method:

A literature search to enhance the understanding and importance of stress relief programs for nurses in palliative care was conducted using the following databases: CINHAL, ANA (n.d.), JAMA, and NCBI. The searches included articles from 2011 to present (2022). The following search terms were used including "and": compassion fatigue• palliative care, palliative care• stress relief• programs, stress management• structured programs, stress management• self motivated. The following search terms were included using "or": stress relief program• structured• unstructured, stress management program• self care,• self implemented. When appropriate data is collected, the studies will be shuffled through, determining which will

be the best fit to support the hypothesis. The results will be formatted into a formal literature review that best reflects the data and recommendations for practice will be made.

Conclusions:

The literature suggests explicit interventions that can reduce compassion fatigue. These protocols should be implemented in all hospitals, hospices and healthcare facilities to improve nurse's morale and quality of care.

415. Older Adult Caregivers and Factors Associated with Volunteering

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Rachel Coleman Sol Baik Jennifer Crittenden

Faculty Mentor: Jennifer Crittenden

Abstract: Providing informal and family caregiving has been associated with reduced socialization, health, and mental wellbeing. In contrast, volunteering has been linked to a myriad of positive outcomes and protective factors. The factors influencing volunteerism among caregivers are not well understood as there has been little focus on people who participate in both activities.

Multivariate logistic regression was used on data from 1,890 caregivers in the National Study of Caregiving (NSOC) (2017) who were matched with their care recipients in the National Health and Aging Trends Study (NHATS) (2017). NHATS collects data on Medicare beneficiaries ages 65 and older; NSOC is a sample of informal caregivers to those NHATS participants. Both NHATS and NSOC samples were weighted to be nationally representative of the U.S. population in 2017. Demographic variables and factors related to caregiving in the last year and volunteer activity in the previous month were analyzed for factors associated with participation in volunteerism.

The caregiving sample consisted of predominantly non-volunteers (0 non-volunteer, 1 volunteer, M = 0.26). Caregivers who volunteered were slightly less likely to be female (0 male, 1 female, M = 0.66) or coresiding with their care recipient, and were more likely to have higher well-being scores but lower self-reported health scores than non-volunteers. Gender, educational achievement, caregiving for a spouse, coresiding with care recipient, caregiving for multiple care recipients, quality of relationship with care recipient, caregiver well-being, having

emotional/physical support, attending religious services, and group activity participation were all significant indicators for caregiver volunteerism.

416. Differing Outcomes in Men and Women After Substance Abuse Disorder Treatment

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Chantal Connelly Jordan Conroy Meghan Cormican Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract:

PICO: In individuals experiencing substance abuse disorder (P), how does the treatment of women (I), compared to the treatment of men (C) lead to differing outcomes (O)?

Topic and Purpose:

According to the NSDUH, about 20 million Americans aged 12 and older suffered from a substance abuse disorder (SUD); in 2017, of these individuals, only about 9.1% have recovered from their disorder. Women are a particularly vulnerable population regarding SUD. Women who experience trauma, discrimination, or both may have a more difficult time trusting health care professionals which may impede their desire to seek treatment for their SUD. The purpose of this review of the literature is to identify evidence-based research to help identify SUD treatment of women, compared to men, and how their outcomes may differ.

Method:

The databases CINAHL and PubMed were searched, limited to studies published in English and after 2010. The following search terms were used: addiction; women "and" addiction; substance use disorder; substance use*; substance use "and" treatment "or" intervention; women "and" substance use "and" treatment; men "and" substance use "and" treatment. Appropriate studies will be retrieved, and a recommendation will be made.

Conclusions:

The literature suggests specific men and women differ regarding SUD. These findings may deem it appropriate to offer gender-specific treatment options for those seeking SUD treatment. Further research is necessary to determine what should be and what should not be included in women's versus men's treatment facilities to provide the best outcomes.

417. Addressing the Gap in Nursing Leadership Competency

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Sarah Brooks Jordan Conroy Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: The gap between nursing academic preparation in leadership competency and development of these concepts in nurse residency must be addressed for the advancement of new nurses and the nursing profession. This gap has been explored through examining leadership competencies and training in the academic setting, the development of leadership during nurse residency, and approaches to bridge the gap between the two. The importance and expectations of leadership competency was examined through the review of requirements of nursing programs as well as the opportunities offered through nurse residencies. Bridging the gap can be achieved through academic-practice partnerships which can increase consistency between academia and clinical practice opportunities. Academic-practice partnerships are also opportunities for the continued growth of leadership competencies and education for new and experienced practicing nurses to improve outcomes. Increasing leadership competency is necessary for the future of nursing to meet the increasing demands of healthcare and continue the advancement of nursing. The provided orientation pathway for Gastroenterology nursing provides an exemplar of continuing to build leadership competency through nurse residency and professional development to narrow the gap. The pathway provides literature support for ongoing training in leadership in the outpatient nurse setting and evaluation of progress for the orientee.

418. Simulation-Based Learning in Nursing Education

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Sarah Hanscome Deborah Eremita

Faculty Mentor: Deborah Eremita

Abstract: Simulation-based experiences (SBE) are a technique that has been used for hundreds of years by the military and aviation programs. The importance of SBE in nursing education grew over the last ten years. In 2014, the National Council of State Boards of Nursing (NCSBN) found that SBE can replace up to 50% of clinical hours without affecting the student's clinical competency or nursing knowledge. The literature review was conducted to explore student outcomes, debriefing, and evaluation in regards to SBE. An electronic search of the literature was conducted using the following keywords: simulation-based learning, simulation experience, student outcomes, evaluation, and debriefing. The literature supported that SBE improved nursing knowledge, self-confidence, critical thinking, and student satisfaction. Faculty-led debriefing was a key component to SBE because it was where the learning took place, where mistakes were fixed, and knowledge was engrained. A formative and summative evaluation may be used; however, formative evaluations resulted in better communication, self-reflection, and self-confidence. With the support of the University of Maine School of Nursing, a Medical-Surgical III SBE was created with the information learned in the literature review. The SBE was a capstone project. Four scenarios were created that consisted of two students taking care of one patient. There was a faculty-led debriefing session following each scenario. Evaluation was conducted utilizing the Creighton Competency Evaluation Instrument (C-CEI). The goal of the SBE was to improve critical thinking, self-confidence, and nursing knowledge in intravenous medication administration.

419. The Effects of Self Care Strategies on Reducing Burnout Amongst Nurses

Submission Type: Exhibit

Submission Category: Allied Health

Author(s):

Lauren Ismail Leann Grogan Danielle Gaboury Gabriella Panagakos Kelley Strout

Faculty Mentor: Kelley Strout

Abstract: How do healthcare facilities that offer self-care programs for nurses to prevent burnout compared to facilities without self-care strategies improve nurse job satisfaction and overall patient safety? In light of the COVID-19 pandemic and the immense amount of work bedside nurses have dedicated to caring for patients, nurse burnout is being experienced by nurses across the globe. This is proven in the literature, as a study of 18,935 nurses showed 34.1% of nurses experienced emotional exhaustion, 12.6% felt depersonalization, and 15.2% described a lack of personal accomplishment (Galanis et al., 2021). When nurses don't engage in proper self-care to handle career-related physical and emotional stress, burnout and compassion fatigue may occur. Using the CINAHL database, a search was conducted on articles that show the effectiveness of self-care strategies on reducing burnout in nurses and improving overall patient care and safety within healthcare facilities. To conduct this search, keywords and phrases such as nursing burnout, understaffing in hospitals, and workplace safety, were used. This search yielded two articles regarding self-care strategies for nurses, eight regarding burnout/patient safety and two about safe staffing ratios. High burnout in nurses is associated with lower patient safety, and self care strategies create a reduction in burnout and an improvement in patient safety (da Silva Batalha et al., 2019). From this, it's recommended that nurses engage in proper self-care such as mindfulness and adequate days off to reduce burnout and improve patient safety.

420. Electronic Cigarette Use in Teenagers, Health Effects, and Solutions for Cessation

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Chris Gooley Sean Sibley

Faculty Mentor: Sean Sibley

Abstract: E- cigarettes, originally developed for the purpose of creating a device capable of delivering traditional nicotine without carcinogenic smoke, have created an epidemic level psychological and social addiction for adolescents and young adults today. E-cigarette devices have been designed to be generationally attractive, while providing intriguing flavors to increase uptake. These devices provide substances such as nicotine and tetahydracannibol (THC) that are sought after for their stimulating and sedating properties. Teens are especially vulnerable to the addictive nature of these chemicals and the social experience, therefore making this a population of interterest for intervention. Evidence and awareness is lacking to inform healthcare providers of short and long term health consequences of patients using e-cigarettes. Family Nurse Practitioners in primary care settings are well positioned to address this public health problem if they are apprised of the phenomena and current evidence-based interventions for cessation. The purpose of this poster presentation is to identify the historical background of e-cigarette devices, adolescent and young adult perceptions of use, health implications, and evidence-based cessation strategies. Additionally, public health policy reform is needed to address this problem at a population level. Raising awareness within the Nurse Practitioner community can influence individual patient outcomes and increase advocacy in the policy arena.

421. Efficacy of the FIFA 11+ Injury Prevention Program in Maine High School Soccer

Submission Type: Poster Submission Category: Allied Health

Author(s):

Meg Lander Christopher Nightingale

Faculty Mentor: Christopher Nightingale

Abstract: The purpose of this research was to assess the efficacy of the FIFA 11+ injury prevention program when used over the course of one soccer season in Maine high school athletics when compared to a standard warm-up approach. Every year, nearly two million injuries are sustained by high school athletes, and the FIFA 11+ program was developed to mitigate the risk of lower body injuries in soccer players. It has been shown to reduce the incidence of injury by one third or more in teenage and older athletes. Participants were randomly allocated into the FIFA 11+ group and the control group. The participants used their assigned warm-up program for the duration of their season. The results showed a statistically significant reduction in the number of injuries sustained by the FIFA 11+ group compared to the control group. The time lost due to injury was not statistically significant. The FIFA 11+ group suffered a total of 4 injuries with 97 days lost and the control group suffered 17 injuries resulting in 194 days lost. The four injuries sustained by the FIFA 11+ group were all serious and/or season ending while the control group sustained three serious and/or season ending injuries. The results suggest that the FIFA 11+ program is effective in decreasing the incidence of mild to moderate injuries.

422. Nursing Burnout in Students

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Skyler Lipka Kellee Leone Emily Kane Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: Nursing burnout affects both nurses and nursing students as they both show similar symptoms of anxiety, headaches, irritability, poor support, excessive workload, mental exhaustion, and physical exhaustion. Nursing students educating themselves on ways to avoid burnout is very important because all of these outcomes are detrimental to various dimensions of the health of a nurse. This topic was investigated by reviewing the literature of the following databases: CINAHL, PubMed, and Nursing Reference Center Plus consisting of articles published in English from 2012 to 2021. The following search terms were used: nursing, nursing students, academics, healthcare were associated with the phrase "and" along with the terms: burnout, mindfulness, stress. Once pertinent studies are retrieved group members will summarize findings and make recommendations for practice. The expected outcome drawn from this research was that participation in structured stress reduction programs for nursing students will have decreased levels of burnout.

423. The Effect of Meditation and Alternative Self-Care Practices in Relieving Nursing Student's Stress

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Lauren Dean Maya Cunningham Eve Daries Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract

PICOT Question: In BSN nursing students, how does incorporating meditation compared to alternative self-care practices into daily routines affect stress and anxiety levels during the course of their nursing program?

Topic and Purpose: Managing and reducing stress and anxiety is a difficult task for nursing students and the various coping strategies that they try to implement into their daily routines are generally ineffective. Determining which coping strategies are most effective at relieving stress and anxiety in nursing students is an issue that has the potential to improve students' health and overall well-being. The purpose of this review is to discover the effects of meditation and self-care practices on the stress and anxiety levels of BSN nursing students.

Method: To conduct research on this issue, the database that will be used is the Cumulated Index to Nursing and Allied Health Literature (CINAHL). Key terms that will be used to search this database for articles include BSN nursing students, meditation, self-care, stress management, and school performance. The search criteria will also include English-language articles and journals, articles and journals published between the years of 2012 to 2022, and that all literature must be peer-reviewed.

Conclusions: The literature suggests that there are various techniques and activities that can be used to reduce stress and anxiety when implemented into the daily routines of BSN nursing students. Further research is needed to determine how meditation and personalized self-care
practices specifically affect stress and anxiety levels among the undergraduate nursing student population.

424. Critical Care Nurses and Mental Health

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Jessica Firstenberg Claudia Fox Dakota Grace Cochran Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: The principal aim of this research project is to review the literature on best practices to support healthcare workers grieving the loss of patients. Being continuously exposed to the death of patients, especially during the COVID-19 pandemic, can adversely affect the mental health of healthcare workers leading to increased rates of depression, anxiety, and suicide. In order to evaluate interventions to support healthcare workers' mental health the following databases were searched: CINHAL, Cochrane, and PubMed. The search was limited to articles published between the years 2012 and 2022 and written in the English language. Keywords used included "critical care nurse," "mental health," "coping," "stress management," and "burnout." Key findings can serve as a reference for stakeholders and individuals who wish to implement clinical innovations surrounding healthcare workers and their mental health after the loss of a patient. Additionally, these findings can also aid in the facilitation of the initiatives focused towards increasing mental health in healthcare workers and providing insight to the effect of grief on the healthcare worker.

425. Access in Healthcare Related to HIV Among Men Who Have Sex With Men

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Elena Jacey Callie Gilmore Keri Hebert Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: Human immunodeficiency virus (HIV) attacks the body's immune system. If not treated, it can lead to acquired immunodeficiency syndrome (AIDS). Eighty three percent of all HIV infections were accredited by men who have sex with men (MSM). A combination of continued sexual risk as well as a lack of healthcare coverage correlates with the persistently high rates of HIV among MSM. Prevention and care among MSM warrants immediate attention, as empirical studies continue to show that MSM are disproportionately affected by HIV, despite advances in prevention and treatment. We asked if among men who have sex with men, does access to healthcare compared to limited access to healthcare decrease the risk of living with HIV? We hypothesize that access to healthcare compared to limited access to healthcare does decrease the risk of living with HIV. The main database we used for our research was the CINAHL. The search terms we used to find articles related to our PICOT question were HIV, men who have sex with men, or MSM, and healthcare. The articles selected were found in full text, written in English, peer reviewed, and published in the past 10 years. Once relevant articles are summarized, recommendations for healthcare policy will be made. Two of our articles are quantitative and the other is a mix of qualitative and quantitative, looking at how different types of stigma impact HIV risk and its measurements. Nurses can use this information to advocate for improved access to healthcare for vulnerable populations.

426. Cognitive Behavioral Therapy vs Dialectical Behavioral Therapy Effectiveness in Eating Disorder Patients

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Ashley Cantwell Enrico Ayala Leah Brooks Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: Among adolescents who are affected by eating disorders, two methods of therapy have been considered: Cognitive Behavioral Therapy (CBT) and Dialectical Behavioral Therapy (DBT). Every 52 minutes around the globe, a life is lost due to an eating disorder. CBT is often used for eating disorder patients, but DBT may be more effective for eating disorder patients with comorbidities such as comorbid mental illnesses. Trying alternative forms of therapy like DBT could save lives for many eating disorder patients who have resisted treatment in the past. In order to determine which therapy is best recommended, the electronic databases chosen were CINAHL, PubMed, and PsycINFO, and included articles from the years 2012-2022. Search terms utilized for the search process include anorexia*, bulimia*, binge eating disorder (BED), eating disorder*, used with the Boolean phrase "and" to incorporate Cognitive Behavioral Therapy (CBT) and Dialectical Behavioral Therapy (DBT). All of the articles included in this search were published in English. Once all relevant data has been collected, group members will collaborate to form a decision on the findings and recommend implementation into real-world applications. Research suggests that dialectical behavioral therapy is effective in adolescent and young adult eating disorder patients that have resisted treatment in the past or have comorbidities such as PTSD and borderline personality disorder. The optimal outcome would be to reduce the number of deaths from eating disorders and to improve the quality of life of those who are affected.

427. Comparing Interventions for Inpatient Psychogeriatric Patients and General Inpatient Geriatric Patients When Assessing Fall Risk and Prevention Strategies

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Libby Colley Carly Fazendin Lindsay Clements Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: Topic and Purpose:

Psychogeriatric patients are at a higher fall risk due to their impaired mental status. Special considerations should be made when assessing fall risk and implementing fall prevention strategies such as, bed alarms, and restraints. The consequences of not solving falls in psychogeriatric patients is continued risk of injury. Falls could lead to broken bones, increased hospitalization, bruising, bleeding, and even death. Preventing these complications would benefit the safety of patients. Not solving the issue of psychogeriatric falls would continue to be a serious risk with potential for further injury to patients or the healthcare team. Further, psychogeriatric patients' fall risk may be enhanced by medications, altered mental status, or other related factors.

Methods:

A literature search was conducted using the databases CINAHL, PubMed, MEDLINE, and PsycInfo. The search terms included: falls prevention or preventing falls or prevent falls or reduce falls and geriatrics or older adults or elderly or psychogeriatric, and mental health or mental illness or mental disorder or psychiatric illness. The inclusion criteria for the review was peer reviewed articles published between the years 2012-2022 published in English and focusing on two populations: inpatient geriatric patients and inpatient psychogeriatric patients. The articles focused on both fall prevention methods and fall risks. Exclusion criteria for the review includes articles published before 2012, outpatient geriatric and outpatient psychogeriatric patients, and patients under the age of 60.

Conclusions:

Once literature is reviewed, recommendations will be made on implementation of successful strategies to reduce fall risks in psychogeriatric patients

428. The Impact of Insomnia on Migraines

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Emma Parrotta Caroline Spencer Emma Perkins Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: Background

The association between insomnia and its causative role in migraine frequency has been thoroughly researched and supported by numerous studies. The higher the severity of one's insomnia, the greater the probability a migraine will coincide. Individuals experiencing migraines often live in fear of onset of a succeeding migraine, causing interference in activities of daily living and preventing intentions of pursuing additional medical care. It is crucial that both insomnia and migraines be studied individually and simultaneously in efforts to better manage these conditions, while decreasing the potential of associated adverse outcomes. Methods

In efforts to learn more about the association between the diagnosis of insomnia and frequency of migraines, journal articles from the CINAHL database were reviewed and analyzed. Articles were searched for within the last 5 years using keywords such as: Nursing, Insomnia, Migraine, Adults, Frequency, and Risks in conjunction with "and". Other inclusion criteria included in the journal article search included peer review articles, full text version available, and published in English.

Outcomes

Once a thorough literature review has been conducted, specific techniques and practices will be identified of which may be implemented into clinical practice in efforts to decrease insomnia's detrimental effects on the frequency of migraines. The effects of insomnia accompanied by migraines may lead to countless health deficits, therefore, it is important to continue to investigate the relationship and possible conclusions.

429. The Effects of Physical Exercise on A1C Levels in Patients with Type II Diabetes

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Ashley Barker Hailey Canelli Bridget Callahan Cole Bryant

Faculty Mentor: Kelley Strout

Abstract: Topic and Purpose:

As type II diabetes has become more prevalent among adults, 90-95% of those with diabetes having type II, non-pharmacological control of the disease is important. Maintenance of type II diabetes is measured through a hemoglobin A1C. Various studies compare how 30 or more minutes of exercise for 3 or more days per week affect A1C levels over the course of a minimum of 12 weeks. The implementation plan includes comparison of different exercise plans to a patient's resulting A1C.

Methods:

To investigate the evidence-based research evaluating the relationship between regular exercise and A1C levels in patients with type 2 diabetes, an online search was performed using research databases. Searches were narrowed to 2010 or newer and involved keywords type two diabetes, A1C, and physical exercise. Appropriate evidence based articles were then selected.

Results:

Upon study of evidence-based articles, research showed decreases of A1C ranging from 0.30% to 1.12% depending on the type of implemented exercise and the amount of time the exercise was performed. Implemented exercises included aerobic and resistance training, tai chi, high intensity interval training, arm swings, and nutrition. Studies lasted between 12 weeks and 8 years.

Conclusion:

Upon review of the literature, the intervention of physical exercise may reduce A1C levels in patients with type 2 diabetes when compared to those who do not regularly exercise. The implementation of this intervention should decrease poor health outcomes, increase glycemic control, lower BMI's, and therefore help with lowering A1C levels and managing type 2 diabetes.

430. Education and Exercise in Reducing Back Pain in New Graduate Nurses

Submission Type: Virtual Presentation Submission Category: Allied Health

Author(s):

Arianna Delaney Sarah Doughty MaryKate Earley Emma Digirolamo Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: In new graduate nurses with less than ten years of experience, will those that have been educated and received in-hospital training on proper lifting techniques and preventing lower back injury report less lower back pain compared to nurses that have not been educated or received training? According to a 2021 PubMed article, up to 90% of nurses suffer back pain and do not regularly exercise. The purpose of this review is to evaluate the impact of educational training programs and physical activity on back pain in nurses. New graduate bedside nurses are more susceptible to suffer from back pain due to improper lifting and transferring techniques, insufficient training and education, and a lack of regular exercise. In this paper, regular exercise is defined as any physical activity in the form of cardio, stretching, core strengthening, yoga, biking, and swimming for thirty to sixty minutes, three to four times per week. The method of research was an electronic search of the literature using CINAHL, PubMed, Google Scholar, and Nursing Reference Center Plus. Articles were limited to those published in English between the years 2012 to present. Keywords used included back pain, back injury, education, nurse*, new graduate, young, pain management, neck pain, hospital, prevention, and training. Once relevant articles were retrieved, the group determined the most applicable articles for this review and summarized the findings. In conclusion, the literature suggests that non-strenuous physical activity along with in-depth training on lifting techniques improves the number of nurses with less than ten years of experience at the bedside reporting back pain.

431. Improving Patient Satisfaction Among Communication Impaired Adults

Submission Type: Poster Submission Category: Allied Health

Author(s):

Kaitlynn Raye Nancy Hall

Faculty Mentor: Nancy Hall

Abstract: Research indicates that approximately 10% of adults have communication impairments (CI), but most practices do little to accommodate these people during outpatient visits. There is a rising necessity for medical professionals, family medicine practitioners in particular, to recognize these CIs so that accommodations can be developed to best meet the needs of these patients. Our study examines the epidemiology of CI in the Northern Light -Eastern Maine Medical Center's Family Medicine Clinic (FMC). Through a patient database search, the study identifies the number of patients with verified CI diagnoses, characterizes the demographics and health status of these patients, including chronic diseases, office visits, hospitalizations and recognition of communication impairment by the treating physician. From there, we aim to describe the health status of those with CI in the FMC patient population, describe the healthcare utilization of those with CI in the FMC patient population, and identify additional markers in the electronic health records (EHR) of the CI patients. It is hypothesized that while some patients seen through the FMC practice will have received diagnoses of CI, the percentage will be much smaller than the indicated 10% of the total patients treated. Further, of those identified, a substantial number will exhibit evidence of chronic disease and increased healthcare utilization as compared to national norms. Finally, it is expected that limited evidence of recognition of CI on the part of the medical providers will be found. The findings are discussed with respect to improving primary care for patients with CI.

432. Wellness Room Utilization for Stress Reduction in Nursing Students to Promote Healthy Social and Family Relationships.

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Emily Mazzarelli

Patricia Poirier

Faculty Mentor: Patricia Poirier

Abstract: Statistics illustrate that nursing school is stressful. Undergraduate nursing students in a BSN program have a rigorous curriculum, and can experience a high level of stress which can affect their mental health. Additionally, entrance into a high paced, stressful career necessitates tools for resiliency to avoid emotional exhaustion. Research has demonstrated that social health and family relationships can suffer from ongoing exposure to stressful situations while attending nursing school and later as a professional RN. Although "wellness programs" have been around for approximately forty years, nursing programs and hospitals have only recently begun to develop Wellness Rooms to promote wellness and mental health. These rooms have varying interventions depending on the facility, but they are designed to provide a private space to promote resiliency, wellbeing and relaxation. A Wellness Room will provide a place of solace for nursing students who are feeling overwhelmed and experiencing stress or anxiety. Ultimately the Wellness Room in the School of Nursing will promote stress reduction, therefore aiding in the maintenance of positive social and family relationships when nursing students are outside of school.

433. Vaping Adolescents and Lung Injury

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Katelin McDonough Bridget Flynn Alexy Hudock Emily Avery Madison Courser

Faculty Mentor: Kelley Strout

Abstract: PICO QUESTION:

Are adolescents who vape at a greater risk for lung injury versus adolescents who do not? TOPIC AND PURPOSE:

Research has demonstrated a growing epidemic of vaping amongst adolescents. More than two million school aged children in the U.S reported using vapes in 2021. Increased usage of vaping products has caused an increased prevalence of lung injuries. The adolescent age group has physiological differences that put them at a greater risk for adverse respiratory effects. METHODS:

Using the CINAHL database on the University of Maine Fogler library website, we searched for evidenced based articles relating to adolescents' use of vaping products, and how they affect the respiratory system. We used phrases such as: adolescent growth and development, smoking cessation programs, and adolescence and vaping. All articles are published within the last five years.

RESULTS:

The literature review showed that adolescents are more likely to discuss vaping use if directly asked by the healthcare professional. The chemicals within the vape aerosol such as diacetyl and carcinogens have been shown to lead to deterioration of the respiratory system. The literature review supported that supplementary material regarding the respiratory system was effective in fostering awareness of the dangers of vaping in the adolescent population. IMPLICATIONS FOR NURSING PRACTICE:

The literature suggests certain interventions such as education plans may reduce the amount of adolescents that vape. The education can be implemented using the school as a platform. Health class or school-wide assemblies are two options for the school nurse to provide education. Further research will be required to determine if education is an effective measure in reducing adolescent vaping.

434. Watching the Flock: How could Small Maine Poultry Farms be affected by an HPAI Outbreak?

Submission Type: Virtual Presentation

Submission Category: Allied Health

Author(s):

Victoria Pennington Anne Lichtenwalner

Faculty Mentor: Anne Lichtenwalner

Abstract: Avian influenza is a highly contagious virus that spreads among wild and domestic birds through bodily secretions, contaminated water/surfaces, or products such as eggs or meat. The highly-pathogenic form (HPAI) results in increased mortality due to culling and/or deaths; the low-pathogenic form can present with less illness unless it mutates to become highly pathogenic.

The study will examine current principles of small-scale Maine poultry farms to assess for any HPAI vulnerabilities using a 20 question survey. The IRB-approved survey will be geared toward small scale poultry farmers in Maine, especially those with free range flocks; the survey will be administered using the Qualtrics database over two weeks. The results will then be statistically analyzed to indicate any trends in knowledge or action that might impact the success of preventing or containing infectious disease such as the current HPAI outbreak.

The study may indicate the existence of a gap in knowledge around proximity of chicken coops to a contaminated surface (which could provide indirect or direct infection). Alternatively, there could also be data pointing toward infection rates being tied to other hosts in the form of small mammals and wild birds. Farmer understanding will be evaluated, but also may be augmented by the survey design.

Overall, HPAI control requires collaboration of animal health agencies and farms to minimize or prevent losses- both economical and physical. This study will provide important information to close biosecurity gaps and to continue providing the strongest defense against HPAI and other reportable avian diseases.

435. Late Effects of Chemotherapy on Cancer Survivors

Submission Type: Poster

Submission Category: Allied Health

Author(s):

Alexandra Beltz Alixandra Elliot George Jarvis Taylor Parsons

Faculty Mentor: Kelley Strout

Abstract: PICO Question:

In cancer survivors, how does chemotherapy treatment compared to other treatment modalities, such as radiation or surgery, affect the cognitive and immune systems 10 years after complete remission is achieved?

Topic and Purpose:

Cancer treatments, including chemotherapy, radiation, or surgery, may impact a cancer survivor's mental and physical quality of life after remission is achieved. Chemotherapy is a toxic treatment agent that affects malignant and healthy cells leading to many side effects. The immune system is commonly affected leaving patients susceptible to infection. Cognitive impairment is also a common side effect experienced by many cancer survivors that lead to a disturbance in functioning.

Methods:

To investigate research focusing on late effects of chemotherapy treatment, we used the University of Maine academic library and searched through the CINAHL database. We used all evidence-based and peer review articles published between 2015-2022 for our research. Keywords used for advanced search include immune function, cancer, cognition, late effects, and chemotherapy.

Results:

Cancer survivors in remission can suffer from mental effects such as anxiety, depression, and

stress which can negatively impact natural killer cell counts as well as lymphocyte counts. Recommended interventions include group therapies, therapeutic massage, and acupuncture. Gut microbiota disruption from chemotherapy is linked to late effects in cancer survivors affecting the central nervous system and immune function.

Conclusion:

Upon review of the literature, certain interventions were found to be effective in managing the life-long effects of chemotherapy or other cancer treatment modalities on the immune system.

436. Negative Effects of COVID-19 on Nurse Burnout

Submission Type: Poster Submission Category: Allied Health

Author(s):

Camilla Silva Kara Milton Lauren Sturgess

Faculty Mentor: Kelley Strout

Abstract: Amidst the 2 years since the start of the COVID-19 pandemic in December 2019, nurses have been overwhelmed with peak incidence rates of patient admissions. Hospitals are overburdened with needs to provide patient care and there is a continuous upward trend with demands for patient beds, medical supplies, and staffing nationwide. With this influx of needs, nurse burnout has steadily increased over the course of the COVID-19 pandemic. This has caused a decrease in the quality of patient care provided by inpatient nurses. The purpose of this article review was to determine strategic measures that have been utilized to decrease nurse burnout throughout the nation. Using the CINAHL database on the University of Maine Fogler library website, we conducted a search of evidenced based articles in order to inquire information regarding hospital based interventions to assist nurses. When conducting our initial search we included key words such as; COVID-19, Nurse Burnout, and Hospital Interventions. Within this specific search criteria, twenty-four articles resulted. The articles found were then further analyzed. Exclusion criteria included articles published prior to 2017, articles which were not peer reviewed, and articles published with emphasis on burnout in the medical field outside the scope of the nursing role. Following those exclusion criteria, ten articles were found to be significant to the systematic article review being completed. Upon review of the literature it was found that hospital-provided interventions such as psychosocial training, psychiatric intervention, and thankful events were found to relieve the strain and stress that the nursing population is currently facing.

437. Validating the Accuracy of a Waterproof pH Data Logger to Monitor Ruminal pH in Batch Cultures of Rumen Fluid Obtained from Dairy Cattle

Submission Type: Exhibit Submission Category: Allied Health

Author(s):

Averi Taylor Diego Zamudio Ayala Raphaella Del Castro Juan J. Romero

Faculty Mentor: Juan J. Romero

Abstract: The objective of this experiment was to assess the accuracy of a waterproof pH data logger (MX2501; Onset, MA) relative to a standard pH meter (HI10532; Hanna Instruments, RI). For this purpose, we conducted an in vitro ruminal incubation using rumen fluid obtained from two lactating dairy cows and corn meal as the substrate (14.9 g). Both probes were placed in the rumen fluid media and incubated at 39°C for 48 h, under anaerobic conditions with agitation. Values were collected every 30 min during the incubation. Resulting data were analyzed with the REG procedure of SAS to determine the relationship between the data obtained from the two pH probes. A linear model with an intercept of 1.175 ± 0.0489 and a regression coefficient of 0.838 \pm 0.0081 was generated, which had an R2 of 0.991 and a mean square error of 0.0003. Remarkably, the model residuals around pH 6.0 were larger relative to other pH values (-0.06 vs. 0, respectively). The Pearson correlation coefficient was 0.996. The fermentation of the starch in the corn meal resulted in a pH drop from 6.79 to 5.90, due to the generation of volatile fatty acids. The pH drop occurred during the first 10 h of fermentation, and afterwards the pH values remained constant, most likely due to the depletion of corn meal nutrients. In conclusion, the waterproof data logger tested was equally responsive to a standard pH meter and can be used to monitor pH changes in culture batch ruminal fermentations.

438. In Adult Patients with Congestive Heart Failure, Does Following a Cardiac Exercise Program Compared to a Lack of Exercise Implementation Prevent Hospital Readmission Within a 30 Day Period?

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Rebecca Witham

Jared Proulx

Spencer Creamer

Faculty Mentor: Kelley Strout

Abstract: PICO Question:

In adult patients with congestive heart failure, does following a cardiac exercise program compared to a lack of exercise implementation prevent hospital readmission within a 30 day period?

Topic and Purpose:

Congestive heart failure (CHF) is a chronic condition that requires an abundance of lifestyle modifications, especially relating to diet and exercise. CHF has been linked to obesity and without adequate weight management through exercise, patients with CHF are much more at risk for developing additional comorbidities that increase their rates of hospital readmission. Methods:

Using the CINAHL database on the University of Maine Fogler Library website and google scholar, we conducted a search for evidence based practice (EBP) articles related to the effects of exercise implementation on patients with congestive heart failure, specifically the risk of hospital readmission. While conducting this search, the inclusion criteria that was used consisted of terms such as congestive heart failure, exercise, and hospital readmission rates. We narrowed our search to research based peer-reviewed articles written in the last five years, and excluded any articles found that did not match the criteria.

Results:

Through the use of multiple controlled trials with randomized patients has shown evidence that exercise based cardiac rehabilitation has improved exercise capacity and the health related quality of life in heart failure patients compared to no exercise control groups after a 12 month

follow up visit.

Conclusion:

After conducting a literature review of the EBP research articles, exercise implementation has been found to reduce the risk of hospital readmission rates and additional comorbidities associated with CHF. These exercise programs should be implemented for all patients with CHF who have been previously hospitalized and personalized to the degree of severity and comorbidities associated with their CHF diagnosis.

439. Hospital Food-Waste Prevention Programs and Their Environmental Impact

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Tanya Roy Paige Solans Jette Fox Timothy Bullard Drew D'Entremont

Faculty Mentor: Kelley Strout

Abstract: PICO Question:

How do hospitals in the U.S. (P) with food waste prevention programs (I) compare in their environmental impact (O) compared to a hospital without any food waste programs (C)? Topic and Purpose:

Hospitals are a leading source of food waste in the U.S. A 2017 study states if a hospital serves 6,640 meals per week, their food waste can equate to more than 48,000 lbs or 24 tons of food annually (Alshqaqeeq, et. al, 2017). Hospitals can combat this food waste with source reduction and repurposing wasted food for agricultural programs.

Search Strategy:

Using CINAHL and JSTOR database, a literature review was conducted using EBP articles using phrases such as hospital food waste prevention and healthcare food waste. All articles are published within the last five years, EBP, peer-reviewed. Each article mentioned food waste reduction strategies including source reduction, composting, donation, and animal feeding. Source reduction was mentioned the most with 6 articles, composting and donation second with 3 articles, and animal feed programs were mentioned in 2 articles. Outcomes:

Source reduction was the most popular method to reduce food waste in the hospital setting. Source reduction strategies could be broken down further into their own categories, such as patient autonomy in menu choices, or giving patients control over portion sizes. Recommendations: Hospitals that do not have food-waste programs in place can implement source reduction programs into their hospitals to reduce environmental impact. Nurses should advocate for the implementation of reduction strategies.

Engineering and Information Sciences

501. An Automated Process for the Production of Rebar Reinforced Concrete Parts Using Additive Manufacturing

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Lara Chern

Richard Kimball

Faculty Mentor: Richard Kimball

Abstract: This research presents the development of a novel composite material that will be functional in ocean-going devices and vessels. This thesis presents a desktop model of a novel reinforced concrete base automated manufacturing process. The scale model consists of a two-step process to autonomously create a rebar structure that would be used as reinforcement for a concrete part. In this process, the rebar is first bent into an appropriate shape by an existing automated wire bending machine which is then added to a 3D printed mold. This part creates the mold for the rebar reinforced concrete part. In this process, the mold is printed simultaneously up to the point of rebar insertion. The rebar is then inserted by a robot from the bending machine and printing is continued. These steps are repeated until the mold is completed, upon which the concrete is added. In addition to the bench-scale model, the design and demonstration of full-scale rebar bending is discussed to show feasibility as the process is scaled up to a commercial-scale system. A discussion of the impacts of this new commercial technology is also discussed, as well as its relevant applications. Automated, mass-producible reinforced concrete could revolutionize the world of construction as it is currently known.

502. Production of Renewable Diesel and Jet Fuel from Biomass-Derived TDO Oil

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Matthew Kline Sampath A. Karunarathne Thomas J. Schwartz Clayton Wheeler

Faculty Mentor: Clayton Wheeler

Abstract: As governments around the world place restrictions on the production of energy from fossil fuels, the demand for renewable fuels is projected to increase. One of the most promising materials to convert into bio-oils is cellulose, which is advantageous as a feedstock because residue from logging, farming, or even municipal waste can be utilized. Several processes have been developed to convert cellulose into bio-oil, one of them being Thermal DeOxygenation (TDO), which shows promise. It is a process developed at the University of Maine that converts organic acids from cellulose hydrolysis and dehydration into a low-oxygen bio-oil with a broad boiling point distribution.

While the chemical compounds in TDO oil could be directly used to produce gasoline, they lack some of the characteristics needed for petroleum middle distillates, such as jet fuel and diesel. In order to replace these fuels, TDO oil must be upgraded using catalytic hydrogenation and ring opening reactions.

This poster presentation discusses the chemistry and reactions required to produce renewable gasoline, diesel, and jet fuels for commercial use. Past, present, and future work on upgrading TDO oil will be discussed, as these extra steps are integral in producing an array of transportation fuels. The presentation will also discuss my research on the hydrogenation and ring opening of bicyclic molecules to produce fuels with better diesel combustion characteristics. Using the catalysts presented in this presentation, we can produce diesel and jet fuels from biomass instead of petroleum.

503. Turtlebot Mapping and Navigation

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Matthew Harzewski Quinn McCarthy Beaver Saoirse Douglas Mason Yu Vikas Dhiman

Faculty Mentor: Vikas Dhiman

Abstract: Modern robots are increasingly mobile, needing to observe and navigate an environment autonomously instead of being fixed in place. Devices such as autonomous vehicles, drones, forklifts and even vacuums need to map out their surroundings and avoid obstacles while operating, which necessitates complex combinations of specialized software. Much of this software is experimental in nature, but modular, inhabiting standardized frameworks like Robot Operating System.

The purpose of this project is to evaluate the present landscape of version two of ROS, which uses a new distributed architecture, and construct a functioning stack of software to handle mapping and navigation on the Turtlebot3 hardware. The highly distributed design has presented many challenges, along with a lack of maintained packages and documentation.

Thus far, the core modules have been evaluated and a single robot can successfully map out a room with a laser scanner and drive to given waypoints on the produced map. The core software has also been Dockerized for easier deployment. Additional work is underway to extend this functionality, including work on autonomous exploration to produce maps without human intervention. The latter goal involves writing software to process map data and detect the edge of unexplored space before dispatching the robot to those areas.

The ROS2 ecosystem is promising but presents many challenges in added network issues and

software that has not yet been updated. Writing software from scratch is a smooth process due to ROS2 seamlessly taking care of networking and inter process communication.

504. Combatting Nutrient Scarcity Using Adsorption of Phosphorus from Recirculating Aquaculture System Wastewater

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Morgan Oehler Jean MacRae

Faculty Mentor: Jean MacRae

Abstract: Recirculating Aquaculture Systems (RAS) treat and recycle process water back into the system, which conserves water and reduces wastewater discharge. RAS wastewater is abundant in phosphorus, a nonrenewable nutrient needed for food production that can cause dead zones when released to surface waters. In this study, a phosphorus adsorbent, RhizoSorb®, was analyzed in RAS wastewater and an artificial seawater solution made up of deionized water, salt, and phosphate to determine if it is well suited for phosphate recovery from RASs. Kinetic and equilibrium adsorption experiments were conducted to compare the adsorption of phosphorus in both solutions and determine the impact of the wastewater constituents on the efficiency of the adsorbent. Wastewater samples were collected at three different salinities (0 ppt, 7 ppt, and 35 ppt) from the United State Department of Agriculture (USDA) Aquaculture Facility in Franklin, Maine. Experiments were conducted on the three different salinities at 10 mgL PO4 concentration for the wastewater samples and artificial wastewater solutions. I found that adsorption capacity decreases with increasing salinity and that the wastewater constituents increase maximum adsorption capacity at high concentrations of salt but had little impact on the adsorption of the sorbent overall. The equilibrium data was better described by the Freundlich isotherm model than the Langmuir isotherm indicating the adsorbent has a variety of sorption sites and is not restricted monolayer coverage. Overall, RhizoSorb ® was effective at phosphorus uptake, and sorption was not greatly impacted by other waste constituents, indicating that is could be used to recover phosphate, especially from freshwater aquaculture waste.

505. The Performance Assessment of a Lighter-than-air Vehicle for Earth Science Remote Sensing Missions

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Maxwell Burtis Wilhelm Friess

Faculty Mentor: Wilhelm Friess

Abstract: This summer, a lighter-than-air (LTA) drone was tested in Alaska to measure glacier bedrock fracture density and orientation. Five flights were made in low wind conditions, and the directional stability of the airship made it too challenging to control in flight to realistically acquire useful image sets. The directional stability of the airship, when compared to an actively stabilized consumer-grade quadcopter was inferior. Flight logs and GPS data from the GPS on the LTA drone were analyzed and quantitative assessment of the observed instability was made. The yaw axis and pitch were analyzed, and the yaw axis instability was greater than the pitch axis instability. Internal instability was observed as a function of yaw oversteer and the lack of active stabilization. Reduction of the yaw instability was attempted by reducing the yaw motor size and implementing active flight stabilization. The observed instability also resulted from external sources like wind gusts and the glacier microclimate. The analysis informed modifications of the LTA drone to make it more stable for glacier research, which were implemented and tested. Also, recommendation for further modifications include the implementation of autonomous flight control and possibly envelope optimization which may also improve endurance. **506.** Development of a Lightweight Embedded Machine Learning System for Obstacle Avoidance

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Connor Firth Babak Hejrati

Faculty Mentor: Babak Hejrati

Abstract: The project we are planning to present for UMSS is focused on the development of a novel system for user-centered autonomous obstacle avoidance. The system consists of a single camera worn by the user, connected to a microcontroller which performs machine learning computations to detect objects in the environment. The novelty of this project lies in the leveraging of recently developed, compact computer vision technology to avoid obstacles in real time on a lightweight system using a new method for obstacle detection. In order to avoid obstacles, we must both detect them within the scene and determine the nearest obstacle to alert the user. Traditional detection methods emphasize identification of possible obstacles, often using object detection algorithms. Our system instead uses image segmentation to detect areas where obstacles do not appear, and analyze the remaining space. This approach avoids problems inherent to the object detection method, such as training dataset limitations and the inability to recognize objects not completely in frame. Additionally, our system is built on a consumer-available foundation, utilizing the Nvidia Jetson Nano as a central processor and several open source Python libraries. This is a significant step from existing human-based obstacle avoidance systems: not only does it use previously cumbersome machine learning networks for monocular depth perception and image segmentation, but it does so in real time on an embedded system. The next steps for this project are the implementation and testing of the system in an experimental setting.

507. Watch Your Flavors: Augmenting People's Flavor Perceptions and Associated Emotions Based on Videos Watched while Eating

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Meetha Nesam James Nimesha Ranasinghe

Faculty Mentor: Nimesha Ranasinghe

Abstract: People engage in different activities while eating alone, such as watching television or scrolling through social media on their phones. However, the impacts of these visual contents on human cognitive processes, particularly related to flavor perception and its attributes, are still not thoroughly explored. This paper presents a user study to evaluate the influence of six different types of video content (including nature, cooking, and a new food video genre known as mukbang) on people's flavor perceptions in terms of taste sensations, liking, and emotions while eating plain white rice. Our findings revealed that the participants' flavor perceptions are augmented based on different video content, indicating significant differences in their perceived taste sensations (e.g., increased perception of salty and spicy sensations). Furthermore, potential future implications are revealed to promote digital commensality and healthier eating habits.

508. Effects of Harsh Environmental Conditions on Mechanical and Physical Behaviors of Tough and Stretchable Hydrogels for the Benefit to Optical Fiber Technology

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Stella Cotner Siamak Shams Es-haghi

Faculty Mentor: Siamak Shams Es-haghi

Abstract: Aboard spacecrafts, use of optical fibers has been limited by their mechanical properties. Optical fibers are made from drawn glass or plastic, which becomes brittle and prone to fracture in the harsh climate of outer space. If optical fibers could remain flexible and durable in the climate of space, the communication and data transfer rate in spacecrafts could be greatly improved. Hydrogels are networks made from long molecular chains that have been swelled in aqueous solution and have unique properties. Loosely crosslinked double-network (DN) hydrogels were synthesized and swelled in an aqueous glycerol solution and a sodium chloride solution in water at specific concentrations in order to make a tough hydrogel that is freeze-tolerant. Samples of glycerol- and sodium chloride- swelled hydrogels were initially tested along with water-swelled control samples using Differential Scanning Calorimetry (DSC) to determine the thermal transitions of the materials. The hydrogel samples underwent freeze/thaw cycles and their mechanical behavior under loading-unloading-reloading large-strain tensile deformation were analyzed. The results of these tests indicate that all the data points for deformation paths coincide showing no mechanical damage happens during deformation. Similar results were observed for samples boiled in their swelling solutions. The results of this study show that the DN hydrogels can sustain harsh environmental conditions and therefore are potential candidates for space-related applications.

509. CEU-Net: Ensemble Semantic Segmentation of Hyperspectral Images Using Clustering

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Nicholas Soucy Salimeh Yasaei Sekeh

Faculty Mentor: Salimeh Yasaei Sekeh

Abstract: Most semantic segmentation approaches of Hyperspectral images (HSIs) use and require preprocessing steps in the form of patching to accurately classify diversified land cover in remotely sensed images. These approaches use patching to incorporate the rich neighborhood information in images and exploit the simplicity and segmentability of the most common HSI datasets. In contrast, most landmasses in the world consist of overlapping and diffused classes, making neighborhood information weaker than what is seen in common HSI datasets. To combat this issue and generalize the segmentation models to more complex and diverse HSI datasets, in this work, we propose our novel flagship model: Clustering Ensemble U-Net (CEU-Net). CEU-Net uses the ensemble method to combine spectral information extracted from convolutional neural network (CNN) training on a cluster of landscape pixels. Our CEU-Net model outperforms existing state-of-the-art HSI semantic segmentation methods and gets competitive performance with and without patching when compared to baseline models. We highlight CEU-Net's high performance across Botswana, KSC, and Salinas datasets compared to HybridSN and AeroRIT methods.

510. Design, Implementation, and Test of Spacecraft Antennae and a Ground Station for MESAT1

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Travis Russell Joseph Patton Steele Muchemore-Allen Ali Abedi

Faculty Mentor: Ali Abedi

Abstract: MESAT1 is a CubeSat that was proposed by the University of Maine in response to NASA's CubeSat Launch Initiative, and in early 2020 was selected by NASA to be launched into a Low Earth Orbit (LEO) in June of 2022. The satellite will carry four low cost complementary metal–oxide–semiconductor (CMOS) cameras which serve as sensing instruments for three science missions proposed by K-12 schools in Maine. The cameras periodically take pictures of Earth to analyze water turbidity, identify urban heat islands, and predict harmful algal blooms. The multi-spectral image data is packed into frames and downlinked as BPSK digital data at a rate of 1200 bits per second using a 100 mW Ultra High Frequency (UHF) transmitter. A ground station is required to receive the data and control the satellite via uplink commands using a Very High Frequency (VHF) radio. A UHF and VHF antenna are required to interface with the spacecraft radio and allow for transmission and reception of signals. To fulfill these requirements, a ground station was built on the University of Maine Orono campus that allows for communication with the MESAT1 spacecraft at low elevation angles. Two quarter-wavelength monopoles were designed with relatively isotropic radiation patterns and low mismatch losses at the command uplink (VHF) and telemetry frequencies (UHF).

511. Roll-to-Roll Manufactured Custom Textured Films for Low-Cost Pulsed Electric Field Water Purification Devices

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Liza White Amelia Cobb Kyaira Grondin Caitlin Howell

Faculty Mentor: Caitlin Howell

Abstract: Water purification and disinfection, particularly of turbid water, is a significant and growing problem worldwide. Recent research at the Wyss Institute has resulted in a device that uses a pulsed electric field (PEF) to inactivate pathogens in water; however, manufacturability, power consumption, and cost remain significant hurdles. Through leveraging paper industry technology in Maine, we looked to optimize electric field generation using a custom textured film in a roll-to-roll manufacturing process. Specifically, we used Maine paper companies' release paper technology as a substrate and explored different types of sputtered metal and coatings to reduce the overall power consumption and cost as well as improve the manufacturability. Mass-manufactured textured materials were cut into singular flow cells, sputter-coated with various metals, and assembled. The flow cells were connected to a pulsed generator that pulsed a square wave at 15 µs at a frequency of 100 Hz with voltages ranging from 50-200 V. Through these tests, we found that the sputter-coated textured material was able to conduct electricity effectively. Additionally, CAD and modeling software simulated various textures to determine the optimal texture to focus the electric field while keeping a low total current density. The simulation data showed that a sawtooth pattern with a slight rounded peak performed the best with a maximum electric field intensity of 3.67 V/µm and a current density of 0.002 mA/µm2. These results demonstrate the feasibility of paper industry roll-to-roll manufacturing processes to produce materials in low-cost PEF water purification devices.

512. JMG Student Site Check-In Application

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Elijah Caret Spencer Morse Michael Ferris Xingzhou Luo Terry Yoo

Faculty Mentor: Terry Yoo

Abstract: Jobs for Maine Graduates (JMG) is a non-profit organization that specializes in helping students, from middle to post secondary education, in career oriented subjects such as applying for jobs, colleges, and internships. They also have an extended learning opportunities (ELO) program. ELOs are out-of-school events/sessions/internships that students can take part in for school credit. We were approached by ELO Director Samantha Brink and ELO Program Manager Lanet Anthony regarding new software. They are looking for another way to track the necessary data for this program because the current CRM system and education platform that they use don't fit that need. Our solution is a web application that will allow students to "check-in" to their particular ELO, this will then be logged on the application. Supervisors at these ELOs will then be able to approve of these check-ins and grade the student's performance. The JMG representative teacher at that student's school will be able to see this information as well. We are currently developing the application using a platform known as budibase, which will help dramatically reduce the amount of code needed to write. Our goal is to deliver an application that is easy to use for students and easy to maintain for the JMG staff by the end of the semester. We are adopting both an AGILE and process-driven software development methodologies involving heavy documentation and planning with iterative development. We are currently in the development phase of the project.
513. The University of Maine Digital Program of Study Approval System

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Mackenzie Creamer Liam Blair Aaron Wilde Vincent King Peter Riehl Terry Yoo

Faculty Mentor: Terry Yoo

Abstract: Our project, The Graduate School Program of Study Appoval System (POSAS), serves as a transition from the University of Maine's physical storage of Programs of Study (POS) documents, to the digital storage of these documents. Currently, POS documents for graduate students are held in physical documents stored at the University of Maine. These physical documents are cumbersome to maintain and update, as advisors must approve even small changes made to these documents. Specifically, the SCIS graduate programs here at the University of Maine have grown larger, and the current problems from the physical storage of these documents can only become more time consuming and problematic as the department grows larger. Thus, the goal of this project is to completely digitalize future POS documents through a University of Maine hosted server that allows graduate students and advisors to work through editing POS documents as well as sign them electronically. Digitalization of the POS documents will greatly reduce the time invested and effort involved with editing and signing these POS documents for graduate students and advisors.

While not done yet, we are aiming to have a functional project by the end of the semester as a proof of concept for the larger graduate school as a whole.

514. Scientific Terminology Extractor (SciTEx)

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Gunnar Eastman Torsten Hahmann

Faculty Mentor: Torsten Hahmann

Abstract: While there are many advances being made in researching and producing new types of cellulose-based materials, the research publications announcing them use highly specialized and sometimes inconsistent technical language, which can make it difficult to know what exactly is new about the materials being produced and how each of them could be used. Thus, it is important to have a means by which to standardize the terminology used to describe such materials to make it easier to search and explore the scientific literature.

The goal of this research is to develop software that can identify the specialized terminology in need of standardization as an important tool towards improving access to the knowledge in scientific publications. The program will take PDF documents as input and read them, while maintaining document structure and keeping track of citations. It will then extract words that are neither names nor in a standard dictionary, and return this list of technical terms and phrases, as well as the location(s) of each term in the document. The tool will be evaluated by collecting scientific articles and separating them into two groups: one will be used for testing during development, the other will be used to measure the program's performance.

The tool will be of broader use to all scientific fields, as it could either return a list of all technical terms, beyond those related to cellulose-based materials, or it could be further calibrated to produce a more refined list tailored to specific fields.

515. Top-Down Approach to Super Flexible and Antibacterial Wood

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Meghan Boos Caitlin Howell Yingchao Yang

Faculty Mentor: Yingchao Yang

Abstract: Airborne microbes are a major cause of respiratory ailments, such as allergies and pathogenic infections. A soft material having capability to inhibit microbe growth can be integrated into face masks to address the spread of microbes. Silver nanoparticles (AgNPs) have been used effectively in previous research to prevent the growth of a range of clinically relevant bacteria. However, the inhalation of AgNPs can be harmful to the human body. In this research, balsa wood was chemically treated to have excellent flexibility and pores as a substrate to house AgNPs, demonstrated with the material's ability to inhibit bacterial growth. The hybrid biomaterials were characterized by Scanning Electron Microscopy, Energy Dispersive X-Ray Analysis, and bacterial zone of inhibition tests to determine the morphology, chemical deposition, and antibacterial properties, respectively. The results showed that the untreated balsa wood has irregular hexagonally shaped pores and the chemically treated balsa wood had smaller, more crumpled pore shapes due to the partial removal of lignin in wood which allows for greater deformation of pores, therefore making the material super flexible. Using hydrothermal methods, AgNPs were grown in the pores of the chemically treated balsa wood. AgNP clusters of approximately 2.5-5 micrometers were successfully synthesized. Zone of inhibition tests on 0.02M AgNO3, and control samples were used to analyze the growth-inhibition capabilities of AgNPs on Escherichia coli. Our results demonstrate the creation of super flexible and antibacterial wood material to help solve the issue of bacterial resistance on flexible medical devices for people around the world.

516. Key Characteristics Analysis of Stanford Drone Dataset

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Josh Andle Salimeh Yasaei Sekeh

Faculty Mentor: Salimeh Yasaei Sekeh

Abstract: The Stanford Drone Dataset (SDD) is a widely used trajectory dataset, containing annotated information of individuals navigating various scenes. Such datasets are useful for many real-world tasks, including trajectory prediction and object tracking. Despite its prominent use, discussion surrounding the characteristics of this dataset is insufficient. In this work, we aim to demonstrate several characteristics of the SDD which aren't readily reported elsewhere, and how not properly accounting for these characteristics can impact model performance. Our analysis of the SDD's key characteristics is important because without adequate information about available datasets a user's ability to select the most suitable dataset for their methods, to reproduce one another's results, and to interpret their own results are hindered.

In order to visualize these characteristics we utilize an information-theoretic measure and custom Adaptive Interaction Measure (AIM). We additionally confirm these findings when possible by demonstrating the impact of these characteristics on a previously published trajectory prediction model. Lastly, we compare and contrast the SDD with the similar Intersection Drone (inD) dataset to study their characteristics, and to emphasize the importance of selecting the most appropriate dataset for a given application. The observations we make through this analysis provide a readily accessible and interpretable source of information which will help improve performance and reproducibility of methods applied to this dataset going forward.

517. Smart Cane for the Visually Impaired

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Jordyn Judkins Sarah Clark Danika Evangelista Caden Scott

Faculty Mentor: Robert Bowie

Abstract: The visually impaired often use blind canes in order to navigate independently. This project aims to assist a visually impaired user by detecting obstacles at range and providing non-visual feedback to the user in order to allow them to maneuver independently. Previous designs for these devices, termed smart canes, have focused on ultrasound techniques for detection while providing feedback through vibrations and sounds; however, they cause unnecessary distractions to the user in disorganized vibrations or extraneous noise. To do this, we used a series of sensors that provides the user with organized tactile feedback based on a range of detection. A ball-point pen style tip was used to allow for some impact absorption which lessens the stress on the user's hand and arm providing more comfort. The design was tested for time to change course, available speed of travel, number of objects hit, and notification time. The tests showed that the design was able to notify the users of obstacles in an acceptable amount of time for them to change course before hitting an object. This showed that the newly designed smart cane provides better feedback and increased comfort for the visually impaired user.

Acknowledgements:

The authors would like to thank Angel Hildreth, Keith Hodgins, Dr. Robert Bowie, Liza White, and Dr. James Beaupre for materials, brainstorming, critical advice, and guidance in this project.

518. The Influence of Heat and Mass Transfer on the Setting Rate of Adhesives Between Porous Substrates

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Mubarak Khlewee

Douglas Bousfield

Faculty Mentor: Douglas Bousfield

Abstract: With the move to replace plastic packaging with sustainable options, glueing operations are needed to form cellulose based packaging. In the setting of hot melt adhesives and water-based glues in the production of paper-based packaging, the controlled penetration of the adhesive is important to obtain rapid setting rates and good bond strength. The penetration of the polymer into the pore space influences the product performance and the ability of the product to be recycled at the end of life. Also, the dynamic flow of fluid into a porous media considering temperature or concentration changes is of interest for a number of other industrial processes. Experiments are designed to understand the extent of penetration of hot melt and water-based adhesives into several porous substrates. Paper surfaces are modified by a range of coatings that have different porosities and pore sizes, and contact angles; these surfaces were characterized with a range of techniques. For hot melt adhesives, a layer of the adhesive is pressed against the paper of interest with the Carver press, for a known time, pressure, and temperature. The final degree of penetration of both systems is determined with silicon oil, mercury intrusion porosimetry, thickness, and weight methods. Here, the accuracy and repeatability of these methods are compared. The strength of the bond at various setting conditions is also measured with the mechanical tester (INSTRON). Using two different press temperatures and pressures, the four methods gave excellent matching results regarding adhesive penetration depths. The mechanical tester (INSTRON) results showed that for a low press temperature, the failure was an adhesive failure mode.

While there is much experimental work discussing various parameters in these operations, little theoretical work has been reported. In this regard, various models are developed to predict the penetration of the adhesive as a function of the fundamental parameters. A finite element method-based model (COMSOL Multiphysics) is used to solve the unsteady-state flow of liquid

adhesives into a single pore or a porous medium accounting for temperature or concentration changes, where the fluid viscosity is a function of temperature or concentration. The model predictions are compared to experimental results. Good agreement for different paper types, pressing times, and temperatures are obtained. For the hot melt adhesive, the model indicates that the substrate temperature is a critical parameter in the penetration of fluid because the viscosity of the fluid can increase a large amount due to cooling in the pore. For the water-based adhesive, the model indicates that when the solvent diffuses through the pore walls, the adhesive particles will accumulate near the pore walls, leading to an increase in its concentration. This increase in concentration will lead to an increase in the viscosity of the adhesive, decreasing the rate of adhesive penetration. 519. Taste and Odor Degradation in Water by Nanobubble-Facilitated Ultrasonication

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Zachary Doherty Sudheera Yaparatne Onur Apul

Faculty Mentor: Onur Apul

Abstract: Treatment of tainted water for drinking water applications is a constant battle, often fought against the presence of earthy or musty odors and tastes. These odors or tastes are a result of the increased production of volatile organic compounds by certain species of algae. Most often the odorous algal metabolite compounds i.e., geosmin (GSM) and 2-methylisoborneol (MIB) are identified as the culprit behind taste and odor issues in drinking water. While many factors such as temperature, microbial concentrations, media, and biodegradable organic matter can affect the removal of these compounds there yet lacks a singular sustainable strategy to degrade the GSM and MIB compounds. This project will explore the use of cutting-edge nanobubble technology for the removal of GSM and MIB. The primary focus of this research is the interaction between intentionally ruptured nanobubbles and the impact it has on GSM and MIB compounds. Ultrasonication is used to induce the nanobubble collapse and thereby generation of hydroxyl radicals is achieved for the degradation of MIB and GSM. Unique behavior and the immense potential of nanobubble technology has been observed for wastewater treatment applications in our earlier studies by 5-6 folds faster mass transfer and up to 50% more chemical removal and the current project allows further opportunities to explore new aspects of nanobubble impact on water treatment.

520. A Critique of America's Public Transportation

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Nathaniel French Meredith Kirkmann

Faculty Mentor: Meredith Kirkmann

Abstract: The state of public transportation in the United States is inadequate, ineffective, and needs investment in comparison to many other countries. Throughout the Spring 2022 semester, I am researching the culture and state of public transportation in the United States. The current state of public transportation in the United States includes subways, trains, bus systems, and ferries. The public transportation system is often inefficient or ineffective compared with other similar economies. An in-depth exploration into the public transportation in Portland, Maine will cover the current public transportation system, its deficits, and compare it to the public transportation system of a similar-sized international city that is more effective and adequate for the population. This research includes a review of the Greater Portland Council of Government's (GPCOG) public transportation planning documents, bicycles, and pedestrian plans, and current analysis of commuting in the Greater Portland area, as well as an interview with Andrew Clark, Transportation Planner at GPCOG. Current legislation and funding are intended to improve the public transportation system in the United States, however, planning for and leveraging that funding to best improve Portland, Maine, and the United States public transportation system is a complex problem. Lessons from other countries can help to inform this work. Connections will be made between suggested future improvements to our public transportation system based on more efficient and effective systems worldwide.

521. Smart Wheelchair Seat Cushion

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Kacey Roehrich Joshua Leake Chisom Orakwue Madison Raza Lisa Weeks

Faculty Mentor: Lisa Weeks

Abstract: Pressure ulcers (PUs) are a common and often avoidable skin and soft tissue injury that afflicts wheelchair users. Current wheelchair cushions designed to minimize PUs provide support and evenly distribute pressure across the ischial tuberosities (ITs); however, these cushions do not address the need for users to routinely shift their weight and restore blood flow to the soft tissues of the gluteal region. To address the need for reducing PUs in wheelchair users, we designed and built a wheelchair seat cushion that can dynamically vary the pressure under the patient to automatically redistribute weight and reduce periods of occluded circulation. A prototype cushion utilizing blood pressure cuffs as air bladders, diagram pumps, solenoid valves, and pressure transducers was developed and tested with the system interfaced through a Raspberry Pi. Testing procedures quantified the accuracy and precision of the pressure transducers against standard gauge pressure, pump efficiency in its ability to supply air under load pressure, and a pressure mapping model which modeled the physics of the cushion and contact forces on the ITs. Preliminary results showed the pressure transducers were within non-statistically significant error when compared to a pressure gauge, the pumps supplied air and held pressure under compression, and the cushion maintained a physiologically appropriate pressure on the ITs with 20-minute cycling over four ranges of pressures across the blood pressure cuffs. Future tests should involve using a pressure mapping system to quantify the efficacy of the cushion in reducing pressure-related injuries. The results demonstrate that our smart wheelchair seat cushion can help reduce PUs by cyclically varying the pressure within the

cushion, thus reducing the pressure exerted on the ITs, which will solve the problem of pressure-related injuries in wheelchair users around the world.

522. Low-Cost Electrical Power System for CubeSats

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Joseph Patton Steele Muchemore-Allen Travis Russell Ali Abedi

Faculty Mentor: Ali Abedi

Abstract: An electrical power system (EPS) is a system of a spacecraft that is responsible for power generation, storage, distribution, and control. An EPS must be efficient, reliable, and it must distribute power safely to all other spacecraft systems. The MESAT1 EPS is a low-cost custom-designed EPS circuit for the MESAT1 CubeSat. A commercial off-the-shelf (COTS) EPS can cost tens of thousands of dollars, while the MESAT1 EPS can be produced for a cost of about \$500. Because COTS EPS units must be designed to meet the power needs of a wide variety of spacecrafts, they may be built to handle a wide range of loads at the cost of efficiency. The MESAT1 EPS is designed to be highly efficient at the specific load requirements of the MESAT1 spacecraft, which results in an overall power savings VS a COTS EPS. While remaining at a very low cost, the MESAT1 EPS features important safety and reliability elements such as battery balancing and temperature control, overcurrent and undervoltage protection, and automatic reporting of EPS system status, and efficiency boosting features such as maximum peak power tracking. In this study we discuss the design and testing of the MESAT1 EPS.

523. Privacy-Based Access Control Model for Blockchain-stored Healthcare Data

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Dilrukshi Abeyrathne Silvia Nittel

Faculty Mentor: Silvia Nittel

Abstract: Healthcare data often contain sensitive personal information, which raises various privacy concerns. Additionally, these sensitive data are currently dispersed across several information systems owned by different healthcare organizations, thereby aggravating this matter. At present, patients have limited access and little control over who has access to which part of their healthcare data; individual patients' privacy preferences are not supported. For instance, an HIV patient may prefer to have a higher level of restriction in accessing their healthcare records than a patient with a diabetic condition. In recent years, research studies have proposed using blockchain technology to support the transfer of ownership of medical records to the patient to protect their privacy. However, blockchain technology alone is not adequate to provide fine-grained access control and ensure privacy. In this work, we develop MyHealthChain, a blockchain-based healthcare record system that includes a novel record structure that supports medical records and preserves privacy. As our main contribution, we introduce and implement the MyHealthChain's Privacy-Based Access Control model (PBAC) to help regulate access to blockchain-stored healthcare data based on a privacy attribute that we define as the Privacy Class. A Privacy Class value is computed based on a function that takes a patient's preferences and the record into account; it is computed per medical record. The record's owner, the patient, can customize a privacy level through this novel function. Thus, instead of having few privacy levels that are the same for all the patients, the proposed PBAC model facilitates the patient to tailor the privacy based on their needs and preferences.

524. Techno-economics and Life Cycle Analysis of Upgrading Woody Biomass to Diesel Blendstock

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Aysan Najd Mazhar Thomas Schwartz Sampath Gunukula M. Clayton Wheeler

Faculty Mentor: M. Clayton Wheeler

Abstract: Woody biomass conversion to transportation fuels have been developed as alternatives to fossil fuel production to reduce greenhouse gas emissions and to increase energy security. Fast pyrolysis, a thermochemical technology, has the potential to offer high efficiencies to produce liquid transportation fuels from woody biomass. Fast pyrolysis involves rapid heating of biomass particles in the absence of air at approximately 500°C and results in non-condensable gases, bio-oil (pyrolysis oil), and char as products. The pyrolysis oil can be upgraded via integrated mild hydrogenation and etherification processes to a renewable diesel blendstock. Predictive models indicate that many ethers, which might be produced from components in pyrolysis oils, would have good blendstock characteristics, such as enhanced cetane and reduced sooting, at the expense of an energy density that is lower than petroleum diesel.

A techno-economic analysis (TEA) and a life cycle analysis (LCA) have been conducted for the integrated process. A simulation was created using Aspen Plus®, and data for fast pyrolysis at 500 °C was used for the base case. Thermodynamic properties of hydrogenation and etherification model compounds were estimated using Density Functional Theory (DFT). The results from the process simulation were used to estimate the capital and operating costs for a plant that processes 2,000 dry metric tons per day of forest residues. The well-to-wheels LCA was developed using Argonne's GREET 2019 software to assess the environmental sustainability of producing the renewable diesel fuel blendstock.

The TEA determined that diesel blendstock products with a lower heating value of 23.33 MJ/kg might be produced from forest residues at a minimum fuel selling price (MFSP) of \$2.99/ Diesel

Gallon Equivalent (DGE). The requirement to remove a lower amount of oxygen from the pyrolysis oil, compared to complete hydrodeoxygenation, means that reforming of non-condensable gases from the pyrolysis reactor provides sufficient hydrogen for the mild hydrotreating reactor. Temperature effects on the pyrolysis oil composition and yields predict that the MFSP might be reduced to \$2.74 per DGE at lower pyrolysis temperatures. The well-to-wheels LCA analysis indicates that the renewable diesel blendstock would have a 93% reduction in fossil fuel use and a 93% reduction in greenhouse gas emissions relative to petroleum diesel.

525. Effect of Interface Contact Conditions on the Electrical Resistance of 3D-Printed Conductive Filaments

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Mackenzie Ladd

Brett Ellis

Faculty Mentor: Brett Ellis

Abstract: A recent innovation in the world of 3D printing has been the introduction of electrically conductive filaments for household 3D printers. Such filaments allow for a broad spectrum of novel 3D-printed electro-mechanical devices, such as simple circuits, sensors, motors, and switches. Although promising, this technology is limited by inconsistent electrical resistance characterization methods and a lack of reliable material characterization data. This research addresses these problems by comparing resistance characterization methods (e.g., alligator clips, embedded copper wire) published in the literature, quantifying electrical resistance as a function of the probe force, numerically determine contact surface area as a function of probe force and geometry, and comparing results to those found in literature. Electrical resistance as a function of probe force was determined on Protopasta Conductive PLA 20 mm \times 20 mm \times 20 mm specimens. Specimens were printed at 220°C with a 60°C bed temperature, at a 0.125 mm layer thickness and with 100% 45°-45° opposed rectilinear infill. Results indicate electrical resistances published in the literature fail to account for: (1) resistance at the probe-filament interface, and (2) influence of probe tip force. Such results are critical to accurately determine the effects of process and micro- and meso-structure on electrical resistance. Emphasis will be placed on the methodology to collect precise and repeatable resistance data of conductive materials. This research is important in that it is foundational to the study of electro-mechanical systems and process- and structure-dependencies of conductive filaments.

526. Geospatial Data Portal

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

David Sincyr III Anthony A. Jackson Grant Shotwell Stephen Kaplan Devin Carter Terry Yoo

Faculty Mentor: Terry Yoo

Abstract: Geospatial data-information describing phenomena and objects located on or near Earth's surface—is all around us, and it increasingly powers the infrastructure and services that drive our internet-connected society. Large-scale analysis of geospatial data is helping researchers and commercial enterprises alike discover new or more efficient ways to tackle the world's biggest problems, from creating optimized package delivery systems to designing infrastructure resilient to climate change. Solving these monumental problems involves an equally monumental amount of geospatial data and processing power to match, and scalable cloud-based analysis platforms are particularly well-suited to meet these resource needs. To match the growing needs of researchers and businesses, our team is working to design and implement the Geospatial Data Portal, a web-based system for managing, viewing, and sharing geospatial data projects. The Portal aims to provide users with a cloud-hosted platform allowing them to upload geospatial datasets, create and execute Python scripts for manipulating geospatial data and generating insightful data visualizations, and share their analyses and visualizations with others. In addition, our users will be able to create groups to work on projects together or make their data publicly available so that anyone can use it in their projects. These functionalities will be made possible through integrating Amazon's highly scalable, reliable, and robust infrastructure for storing and managing data. Amazon's services will also provide significant security for the project: utilizing Amazon Lambda to securely run user-supplied code without threatening the server with malicious attacks. To meet the needs of users with ambitious and

diverse goals, our team aims to maximize the utility and scalability of the system; that is, we have designed the system to provide geospatial project managers the tools and flexibility necessary to work with a wide variety of data types, file types, and goals, and to accommodate their resource needs at short notice without breaking their data analysis script or noticeably disrupting their workflow.

527. Identifying the Magnitude and Character of Microplastic Pollution in Frenchman Bay, Maine

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Jessica Liggiero Taylor Bailey M. Dilara Hatinoglu Lauren Ross Onur Apul

Faculty Mentor: Onur Apul

Abstract: With the rising global crisis of microplastic contamination in aquatic systems, this study aims to determine the source of microplastics pollution in Frenchman Bay in Maine for the first time. Our work aims to answer the following research questions: Do microplastics come from the freshwater streams, surface runoff, and rivers entering the bay or from the vast open ocean or are they locally generated by fishing activities? Within two seasons over four months, 99 water samples were collected from Frenchman Bay from the coast. There were eight different sites, where five were saltwater and three were nearby freshwater feeding into the Bay. In addition, this research investigated correlations between the presence of microplastics and the turbidity of the water to understand if microplastics behave like other natural colloids. In terms of methods used, at each site 30 liters of water were filtered through a fine-mesh sieve and samples were cataloged in the lab using a microscope. Results indicate that there were denser colloids in the freshwater samples, but more microplastics found in the saltwater samples with less dense sediment. From this research, we found some preliminary conclusions that show the microplastics come from the ocean or localized fishing activities. We have found a link between low turbidity or sediment and elevated microplastics.

528. The Exploration a Power Spectrum Analysis in Comparison with the Two-Dimensional Modulus Maxima (2D WTMM) in Fractional Brownian Motion (fBm) Images

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Basel White Andre Khalil

Faculty Mentor: Andre Khalil

Abstract: The CompuMAINE Laboratory utilizes a powerful multifractal method called Two-Dimensional Wavelet Transform Modulus Maxima (2D WTMM) method to develop predictive diagnostic tools in biomedicine. To study tumor-prone breast tissue from mammograms, a sliding window approach based on the 2D WTMM method has been successfully developed, based on the extraction of the Hurst (H) roughness exponent. However, the approach is attributed to increased computational difficulty and time. With this, the goal of this research is to explore replacing or combing the 2D WTMM approach to the calculation of H with a power spectrum analysis proven to be more computationally efficient, albeit less versatile. Our hypothesis is that the power spectrum analysis is more accurate than the 2D WTMM approach with monofractal images associated with H values less than 0.5, and the opposite for H values greater than 0.5. In order to achieve verify this hypothesis, a roughness analysis is being conducted on fractional Brownian motion (fBm) images through the use of both methodologies in which several calibration parameters and the wavelet of choice for the 2D WTMM methodology are being studied to observe changes in computational efficiency. The utilization of the Mexican hat wavelet function, rather than the Gaussian function, has been shown to increase computational accuracy for fBm images H values greater than 0.5. The variation of coefficient of determination (R2) values in both the 2D WTMM and power spectrum analysis is currently under investigation. With more results from the investigation of these two analyses, future research entails the application of the optimized methodology to the gridding roughness analysis on grayscale mammograms.

529. Metal 3D Printed Conformal Cooling Channels

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Liam King Branden Hebert David Winchell Connor Larson Brett Ellis

Faculty Mentor: Brett Ellis

Abstract: Recently enabled via powder-based additive manufacturing of metals (PBAMM), conformal cooled injection molds have reduced cycle times by up to 12%, and decreased warpage and residual stresses of molded parts by enabling tailorable cross-sectioned, non-prismatic cooling channels to be placed adjacent to molding surfaces. Although useful, PBAMM molds are expensive. This research seeks to address this problem by exploring the suitability of Bound Metal Deposition additive manufacturing of metals (BMDAMM), costing \sim 70% less than PBAMM, for injection mold applications. Experimentation included the design, manufacture, and testing of a 76.2 mm × 50.8 mm × 15.2 mm 316L benchmark component. The component contains two 1/8" BSPP water fittings, thermocouple and heating element ports, and an irregular-pentagon cross-sectioned cooling channel having an S-shaped path through the infilled component. The infill is oriented in the build direction, thus imbuing transversely isotropic properties at the mesoscale. After heating to a temperature of approximately 300°F, heat transfer properties will be characterized via thermal imaging of the surface, thermocouple measurements within the component, and mass flow and temperature measurements of the approximately 50°F cooling water. Next, the cooling channel will be sealed and pressurized to 10,000 psi to determine the pressure at which the pressure seal of the cooling channel is lost. Finally, the component will be compressively loaded to simulate pressure exerted by the molten material during injection. Results from the three tests will be compared to values estimated via finite element analysis thus indicating the suitability of BMDAMM injection molds.

530. Deformable ProtoPNet: An Interpretable Image Classifier Using Deformable Prototypes

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Jon Donnelly Alina Jade Barnett Chaofan Chen

Faculty Mentor: Chaofan Chen

Abstract: Machine learning has been widely adopted for many high-stakes applications such as healthcare, finance, and criminal justice. To address concerns of fairness, accountability and transparency, predictions made by machine learning models in these domains must be interpretable. One line of work approaches this challenge by integrating case-based reasoning with deep neural networks to produce accurate yet interpretable image classification models. These models generally classify input images by comparing them with prototypes learned during training, yielding explanations in the form of "this looks like that." However, methods from this line of work use spatially rigid prototypes, which cannot explicitly account for pose variations. In this paper, we address this shortcoming by proposing a case-based interpretable neural network that provides spatially flexible prototypes, called a Deformable ProtoPNet. In a Deformable ProtoPNet, each prototype is made up of several prototypical parts that adaptively change their relative spatial positions depending on the input image. This enables each prototype to detect object features with a higher tolerance to spatial transformations; consequently, a Deformable ProtoPNet can explicitly capture pose variations, improving both model accuracy and the richness of explanations provided, thus enabling wider use of interpretable models for computer vision.

531. Low-Cost Forest Senor Networks Reliability and Wireless Capabilities

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Thayer Whitney Sonia Naderi Ali Abedi

Faculty Mentor: Ali Abedi

Abstract: Machine learning has been widely adopted for many high-stakes applications such as healthcare, finance, and criminal justice. To address concerns of fairness, accountability and transparency, predictions made by machine learning models in these domains must be interpretable. One line of work approaches this challenge by integrating case-based reasoning with deep neural networks to produce accurate yet interpretable image classification models. These models generally classify input images by comparing them with prototypes learned during training, yielding explanations in the form of "this looks like that." However, methods from this line of work use spatially rigid prototypes, which cannot explicitly account for pose variations. In this paper, we address this shortcoming by proposing a case-based interpretable neural network that provides spatially flexible prototypes, called a Deformable ProtoPNet. In a Deformable ProtoPNet, each prototype is made up of several prototypical parts that adaptively change their relative spatial positions depending on the input image. This enables each prototype to detect object features with a higher tolerance to spatial transformations; consequently, a Deformable ProtoPNet can explicitly capture pose variations, improving both model accuracy and the richness of explanations provided, thus enabling wider use of interpretable models for computer vision.

532. Multiscale Anisotropy Analysis of Second-Harmonic Generation Imaging of Pancreatic Cancer

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Joshua Hamilton Karissa Tilbury Peter Brooks Andre Khalil

Faculty Mentor: Andre Khalil

Abstract: Pancreatic ductal adenocarcinoma (PDAC) is one of the most lethal cancers known to medicine with a median survival time of 6 months from diagnosis. PDAC is typically characterized by a dense, stiff tumor microenvironment from hyperactive synthesis of collagen resulting in fibrosis. This fibrosis is protumorigenic and limits the penetration of existing therapies. Interestingly, through animal studies, multiple attempts to reduce collagen deposition resulted in more lethal and aggressive tumors with less connective tissue. A new tool is needed to quantitatively characterize the underlying structural changes in collagen, to increase understanding of the dynamics of the tumor microenvironment. Second Harmonic Generation (SHG) provides a label-free, collagen-specific imaging method with submicron resolution. Forty PDAC H&E slides were annotated by a pathologist to identify cancer, fibrosis, and normal adjacent areas and imaged to create a database of 684 SHG images. Collagen signatures in each region were characterized using a multi-scale wavelet-based anisotropy technique developed in the CompuMAINE Lab. SHG images were wavelet transformed at 50 different size scales to calculate an anisotropy factor at each scale which identified statistically significant differences of collagen fiber organization between normal and cancerous regions. This method also identified unique characteristics of short and long-range collagen organization to create a potential classifier with predictive capabilities. This novel combination of SHG microscopy and wavelet analysis shows promise as a quantitative metric for understanding tissue structural changes, including possible laboratory and clinical applications in the future.

533. Non-Contact Image Analysis of Breathing Rate Using An Unmanned Aerial Vehicle (UAV)

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Basel White Maggie McCarthy Dominic Kugell Jacob Holbrook Andre Khalil

Faculty Mentor: Andre Khalil

Abstract: Due to their ability to travel through complex terrain efficiently, UAVs are often used in search-and-rescue operations to locate individuals who are lost and possibly injured. The necessary technology and ability to assess the subject's vital signs without physically contacting them is lacking. To address these gaps, an image analysis technique has been developed to analyze videos and photographs taken in a non-contact manner and output accurate vital signs for an incapacitated individual. The image analysis software FIJI was used, and two scripts were developed: (1) to segment the chest area from the UAV output video of the respective patient and (2) to utilize convolution to detect the edge of the chest on this same video. These two approaches allowed for the difference in the chest area throughout the video to be quantified, allowing for the extraction of the patient's breathing pattern as a function of time. Aspects of the device that are critical to the project's success will be tested to ensure the reliability and durability of the methodology, such as comparing the efficiency of the two different strategies, (1) and (2), testing the accuracy of the body temperature reading, creating a comparison of a heart rate measurement from an oximeter versus from our scripts, and a drone calibration. Preliminary results demonstrate this methodology will successfully output viable vitals, adding a new aspect to search-and-rescue techniques.

534. Growing Digital Forest

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Kingsley Wiafe-Kwakye Torsten Hahmann Kate Beard

Faculty Mentor: Kate Beard

Abstract: Forest dynamics, which include rapid environmental changes, natural and human disturbance, and various management objectives, interact in various ways to create a diverse and complex system in the forest. Despite prior work to better understand forest dynamics, there are still many open questions about how these complex interacting factors interconnect to build the forest ecosystem. This limitation has multiple negative consequences for the future of forests, including a limited ability to forecast how trees, and hence the Earth's climate system, will respond to rapidly changing climate circumstances. Accurate forest ecosystem predictions will help make more informed decisions when faced with erratic changes in climate conditions. This study presents the Digital Forest, an ontology-based framework for integrating and analyzing forest related data in various forms. A forestry domain ontology and a geographical statistical ontology make up the Ontology layer, used to create a representation of spatial and time varying forest-related data. The Ontology layer provides the integrative language for expressing comprehensive analytical questions. The SPARQL/GEOSPARQL layer provides a scalable query and exploration interface for the integrated data, while the Machine Learning layer provides tools to spot and summarize more complex trends and unknown associations. Presently, the ontology has enabled the development of a knowledge base with data on terrain, temperature, geology, and tree species that connects to the digital forest's semantic interface to support query and visualization operations. The study showed that ontology could be used to integrate and to explore diverse spatio-temporal data sets that can provide answers to complex questions.

535. SMART Tourniquet

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Abigail Varney Kaisa Heikkinen Benjamin Hutchins Kaitlyn Webber Lisa Weeks

Faculty Mentor: Lisa Weeks

Abstract: Tourniquets are used in emergency scenarios to stop life-threatening blood loss, and in the process, they often cause irreversible tissue damage that can lead to acute compartment syndrome (ACS) or amputation. Certain companies have created surgical tourniquets that reduce tissue damage and blood loss, however, these devices are not effective in the military or search and rescue applications as they are not portable or durable. The purpose of this work is to create a safe and affordable tourniquet for emergency situations. A device was designed to address irreversible tissue damage. Its effectiveness was validated in four key ways: temperature variation testing of an endothermic chemical reaction, delivery mechanism testing of a topical numbing agent, pressure testing an automatic air pump, and sensor testing for heart rate measurements. The temperature variation testing results showed that there was a 50% decrease in temperature, which cools the device from 24°C to 13°C upon application. Testing indicated that delivering the numbing agent by punching holes in packets containing the agent results in an adequate amount of medication reaching the skin when pressure increases. The results suggest that our tourniquet is applicable in emergency scenarios while eliminating unnecessary tissue damage caused by current tourniquets.

Acknowledgements:

The authors thank Dr. James Beaupre, Dr. Robert Bowie, Dr. Lisa Weeks and Liza White for design and application help, and critical advice.

536. Microscopy Methods Second Harmonic Generation and Fluorescent Photo-activated Localization Microscopy and their Applications in Biological Systems

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Jan Wusik Sam Hess

Karissa Tilbury

Faculty Mentor: Karissa Tilbury

Abstract: The introduction of lasers into the sciences has enabled researchers to investigate many different types of systems, from atoms to biological systems. We discuss two novel microscopy methods, Second Harmonic Generation (SHG) and Fluorescent Photo-activated Localization Microscopy (FPALM) and their applications into biological imaging. We present an overview of the physics behind SHG, and discuss its biological applications. We show data from a specific study of mouse skin from an experiment where the integrin alpha-v beta-3 was knocked out, while comparing it to the wild type sample. We also captured the auto-fluorescent signal, and found the ratio of intensities between a coupled SHG image and the auto-fluorescent signal. We concluded that there was not a statistically significant difference between the two samples in terms of this ratio, meaning that the integrin alpha-v beta-3 does not have an effect on the structure of collagen.

We provide a similar analysis of FPALM, and we show a cell expressing hemagglutinin (HA) marked with photoactivatable green fluorescent protein (PA-GFP). FPALM was able to show clusters of HA in the cell in a high resolution, and track movement of HA in a live cell. Finally, we discuss the systems where they are most effective, along with their advantages and disadvantages over each other.

537. Identifying Valid Sizes for Raster Regions in Topological Relations

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Brendan Hall

Faculty Mentor: Max J. Egenhofer

Abstract: Topological relations are an essential element of spatial queries and reasoning about spatial information. The predominant model for topological relations in geographic information systems — the 9-intersection — identifies sixteen different relations between groups of pixels (called raster regions) in a raster space. Several of these relations are dependent on the raster region sizes to be realized. An example named 'Completely Inside' would require rasters to be sufficiently different in size for one raster to entirely encompass the other. Based on the size ratio required to realize certain relations, the hypothesis is that relations are predictable based on the two rasters vertical and horizontal extents. In order to determine the baseline for the realizability of each of the sixteen relations, a Python program was developed that calculates all possible relations for two fixed-size raster objects by determining their unique 9-intersection matrices. Visualizing the size-based existence of the relations over the sixteen relations' conceptual neighborhood graph — an arrangement of the sixteen relations by highest similarity — patterns and trends become visible so that the hypothesis can be tested.

538. Low-Cost On-Board Computer for CubeSats

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Steele Muchemore-Allen Joseph Patton Travis Russell Ali Abedi

Faculty Mentor: Ali Abedi

Abstract: MESAT1 is a CubeSat that was proposed by the University of Maine in response to NASA's CubeSat Launch Initiative, and in early 2020 was selected by NASA to be launched into orbit in 2022. An on-board computer (OBC) is a subsystem of a CubeSat that is designed for monitoring and control of other subsystems, processing associated with the payload, and data packeting associated with communication. The MESAT1 OBC was designed to monitor the specific subsystems of MESAT1, as well as to manage the science payload, four consumer grade digital cameras. The OBC will also be the primary form of communication with the on-board radio, a linear transponder module (LTM) provided by AMSAT. The OBC was designed around the use of a Raspberry Pi Compute Module 3+ system-on-chip (SOC). Two of these SOCs were used on the OBC, with one being the primary controlling unit and the other being used as a redundant backup. This allows the system to keep functioning after any possible single-upsets from ionizing radiation in space. The MESAT1 OBC can be produced for a low cost, while a commercial off-the-shelf OBC can cost tens of thousands of dollars.

539. A Customizable, Accessible, and Multimodal Smartphone Application to Monitor Speaking Rate in a Clinical Setting for Children with Fluency Disorders

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Aubree Nygaard Jessica Holz Christopher Dufour

Faculty Mentor: Christopher Dufour

Abstract: For children with fluency disorders, such as stuttering disorders, research demonstrates significant negative life impacts in the areas of educational achievement as well as social, emotional, and mental health. Approaches to intervention and management of fluency disorders for children often involve the support and clinical treatment by a Speech Language Pathologist. One common strategy taught in therapy is for children to use a reduced rate of speech. This method, unfortunately, presents limitations. It is clinician dependent, which is more likely to be subjective, inconsistent, and delayed. It also may not encourage carryover to situations in which a clinician is not present. With this project we present an alternative method for teaching reduced speech rate through an objective, real-time feedback measure, presented within a smartphone application. Though some smartphone applications for speech rate monitoring exist, our application aims to improve on existing designs in its specific intended use for children in a therapeutic setting and its emphasis on accessibility, customization, and multimodal interaction. Our design enables a clinician to customize the application to suit a particular child's needs through options including haptic, visual, and auditory cues, creating a more child-centered experience. The user interface changes in real-time as the child speaks, thereby providing them with a method to independently monitor and adjust their speech rate if needed.

540. Development of a Rapid LAMP-Based Field Method for Fecal Contamination Monitoring

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Kettie Cormier Casey Schatzabel Jean MacRae

Faculty Mentor: Jean MacRae

Abstract: Rapid and field deployable fecal contamination tests are needed to ensure the safety of our drinking water, recreational water, and shellfish harvests. In this project, I developed equipment to enable field application of a loop mediated isothermal amplification (LAMP) test method to track fecal contamination in water. LAMP is a highly specific and sensitive gene amplification technique that has been used as a simple, rapid diagnostic tool for early detection and identification of microbial diseases (Parada et al., 2008). A portable heating device was designed to maintain the required temperature for the amplification reaction. Also, to make the results more reliable, and possibly quantitative, a light source and a phone-based detection system were designed to measure the color change produced in the reaction. This research contributes to the development of a simple and inexpensive test that doesn't require a lab, and that anyone can use to test the safety of their water.

541. Boardman Computer Science Lab Web Portal

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Aaron Schanck Jack Brisson Klei Bendo Alex Landry Samual Morse Forrest Swift Terry Yoo

Faculty Mentor: Terry Yoo

Abstract: The Boardman Computer Science Lab is a long-standing resource for UMaine Computer Science students. Its main purpose is to aid students with issues and questions related to computer science and acts as a meeting place for students working in groups. However, the Boardman Lab has historically struggled in broadcasting accurate and up-to-date scheduling, and stagnation in terms of systemic improvements.

In-House Operations in conjunction with Mr. Christopher Dufour, the director of the Boardman lab, is producing the Boardman Computer Science Lab Web Portal to mitigate these shortcomings. This application will include features for students to view helpers' availability dynamically and schedule help sessions, and collect data automatically to better understand where students need help as well as saving user feedback to gauge the effectiveness of specific helper's methods.

The Boardman Web Portal is currently in development at approximately 75% completion, set to be completed and distributed for alpha testing in early April. We are, at present, able to effectively demonstrate remote student sign-in, scheduling visualization and session creation, and student feedback. In the coming weeks, we will finalize the data analysis features and other small miscellaneous and aesthetic updates.

Our project aims to mitigate the current shortcomings of the Boardman Lab, as well as to propel

it towards continuous improvement. The In-House operations team is aiming to provide a genuine utility service for a program that has helped each of us greatly throughout our undergraduate experience so that future students can have an even greater experience.

542. Artificial Intelligence for Energy Efficiency (AI4EE)

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Noah Lambert Drew Hooke

Faculty Mentor: Drew Hooke

Abstract: The University of Maine Orono campus contains approximately 200 buildings, many of which contain climate-sensitive equipment with occupants coming and going all day, every day. Currently, a majority of buildings on campus rely on the most basic, conventional thermostats that are set to a specific temperature. These conventional thermostats continue to use energy until the desired temperature is reached, regardless of whether the building is occupied or needs constant temperature. Though some buildings require more consistent climate control, other buildings may not. In essence, conventional thermostats are all well and good until a building is left unoccupied with temperatures being maintained unnecessarily. Additionally, because conventional thermostats narrowly focus on meeting a set temperature, they can also fail to meet the strict climate control needs of sensitive equipment when other variables (such as weather) change and impact the internal temperature of the building. AI4EE seeks to solve these problems by creating a thermostat that harnesses the power of artificial intelligence to generate smart schedules for buildings. These smart schedules will adapt to constantly changing variables that affect climate, including the building's current and upcoming occupancy status and the effectiveness of the building's insulating properties. During this performance period, a custom prototype of a wireless temperature and humidity sensor was developed. These sensors were designed as a base station-satellite system (BSSS) consisting of one central computer. The central computer wirelessly manages and collects data from several satellite sensors before packaging the data to be sent for future processing. These developments highlight the massive amounts of potentially wasted energy from heating our buildings and may ultimately help pave the way for a more energy-efficient campus.

543. Wave Attenuation Over Submerged Oyster Farms

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Liam Hanley Kimberly Huguenard

Faculty Mentor: Kimberly Huguenard

Abstract: This project is one of several projects currently active in the Coastal Engineering group at the University of Maine's Department of Civil and Environmental Engineering. The purpose of this study is to examine the use of sunken, over-wintered oyster farms as a strategy to reduce shoreline erosion. Wave forces constantly erode shorelines across the world, and natural solutions to coastal erosion have been studied to be effectual and generally better for ocean ecosystems than "hard engineering" solutions. Aquaculture represents a large portion of Maine's economy, and some studies have been conducted on capitalizing on the breadth of Maine aquaculture for engineering solutions. This project involves measuring wave characteristics on a longline of oyster cages owned by Maine Ocean Farms, in Freeport, Maine. Field observations will be used to produce a numerical model of the localized area, so that different environments and farm layouts can be tested for efficacy. This project will inform oyster farmers and policy makers on layout strategies for their sunken oyster farms, with shoreline retreat in mind. This study will quantify the effect of bottom lying oyster gear on reducing wave height from winter storms and inform how these effects can be increased generally in Maine, to reduce coastal erosion. This project is currently ongoing and will have results by the end of Summer 2022.
544. Building a Mobile Application to Facilitate a Safe Virtual Reality Experience

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Nicholas Sherman Ethan Trott Sam Braga Christian Doiron Chris Vogel Terry Yoo

Faculty Mentor: Terry Yoo

Abstract: In recent years, VR technology has consistently improved and become more desirable to the average consumer. As a result, more companies are developing VR applications that include opportunities for people to interact online. The goal of this project is to work with Real Time Reality to provide this interaction in an application that is simple and accessible. The project includes the creation of a Progressive Web App (PWA) for use on iOS and Android devices. The PWA will allow users themselves to be modeled in virtual space, also called the "metaverse". This "metaverse" is the focus of Real Time Reality. The goal is to create a safe and secure environment using a virtual avatar that is based on their real life appearance. This model will be created and managed through the PWA, by allowing users to create an account and sign in, either via a username and password or through biometric authentication. Users will be able to take a short video of themselves, and upload it to a server to be converted into their avatar. The PWA will show the status of the avatar model generation to the user. Then, once a user has a model, the PWA will coordinate the connection between the smartphone and the VR headset, transforming the real time video feed into pixel coordinates, sending them to the VR headset over this connection. This will facilitate the animation of the user's model in the metaverse, allowing for real time movement.

545. Hybrid Carbon Nanotube based Catalytic Materials as a Chemical Sensor

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Bivek Bista Sharmila Mukhopadhyay Wenhu Wang

Faculty Mentor: Sharmila Mukhopadhyay

Abstract: This research aims to investigate a new type of sensor platform for using hierarchical hybrid solids comprising of carpet-like arrays of Multi Walled Carbon Nanotubes (MWCNT), attached to a conducting porous carbon substrate, and activated with analyte-sensitive nano-catalysts. For this project, we are using palladium (Pd) nanoparticles (Vijwani et al 2012, and Wang et al, 2021) that interact with chemical species such as ammonia. It is expected that the MWCNT carpets activated with Pd nano-catalysts will provide a significant increase in the number of reaction sites resulting in more electron transfer between the sensor and analyte, hence show increased sensitivity as chemical detector.

Samples were synthesized using Plasma Enhanced Chemical Vapor Deposition (PECVD) and Thermal Chemical Vapor Deposition (TCVD) process. Material Characterization was performed using Scanning Electron Microscope (SEM), X-ray diffraction (XRD), and X-ray Photoelectron Spectroscopy (XPS). Two different techniques were used to evaluate the correlation between processing, structure, and electrical properties of these materials: measurement of resistance using Keithley multimeter, and electrochemical behavior using Cyclic Voltammetry process. Three different materials have been compared: carbon fiber cloth (CFC substrate), MWCNT enhanced CFC (MWCNT-CFC), and Pd nanoparticles attached to MWCNT-CFC (Pd-MWCNT-CFC). Our study confirms that these materials, especially Pd-MWCNT-CFC samples, exhibit promising electrical response, and may potentially lead to flexible and customizable sensing platforms in the future. **546.** Improving Coastal Water Quality Monitoring and Decision-Making Through Rapid, Simple Field Testing

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Casey Schatzabel Kettie Cormier Jean MacRae

Faculty Mentor: Jean MacRae

Abstract: There is a need for field-deployable methods that can quickly detect fecal indicator bacteria (FIB) to assess the safety of drinking water sources, recreational waters, and seafood harvests. Water quality has traditionally been monitored using bacterial culture-based methods, which is a time-consuming process (Jiang, 2018). Newer molecular diagnostic methods, such as PCR-amplification, require specially-trained lab workers and expensive equipment (Zhu, 2021). The goal of this research is to use LAMP (loop-mediated isothermal amplification)-based technology to develop a quicker, easier, and less expensive field-based detection method that does not require specialized equipment. A further goal is to minimize the waste produced in using this test method. The best testing protocol depends on the goals of the user, but all methods consist of three steps: sampling/concentration, extraction/preparation, and detection. Two concentration steps will be assessed in this work: grab sample filtration and passive sampling. Simple heat treatment will be compared to field-manageable extraction methods, such as paramagnetic bead or column-based nucleic acid purification, for sample preparation. The LAMP detection step will be optimized for the required level of sensitivity for specific users. The results will be compared in terms of cost, time, materials, compatibility, waste generation and ease of use. Appropriate workflows for concentration, extraction and detection of E. coli will be identified for users who prioritize different factors, such as location of testing, cost or sensitivity. These workflows may generate more efficient monitoring techniques for regulatory bodies, municipalities, aquaculture operations, and off-grid system management.

547. Facilitating Early Detection of Neuropathy

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Ashley Drexler Jon Donnelly Sammy LaRochelle Maxwell Prybylo Travis Tovey Terry Yoo

Faculty Mentor: Terry Yoo

Abstract: Small fiber neuropathy can be caused by over 30 medical conditions including diabetes, aging, and chemotherapy. Most common symptoms include: pain, numbness, tingling, and loss of motor functions. Currently there are no reliable options for early detection of small fiber neuropathy. Recently much work by Neuright, Inc has focused on early detection of neuropathy by measuring electrical activity in nerves via a microneedle array providing a readout on the nerve health. In this project we create a user interface for such a device so that the electrical activity can be viewed or stored. The user interface includes a robust database that connects to the microneedle array and securely receives electrical activity. The interface was designed to be deployed in a hospital setting and includes the ability to add multiple clinicians, staff, and patients. In addition, we also develop a machine learning algorithm to analyze the electrical activity for signs of small fiber neuropathy. Through these features, this project paves the way for easily and effectively implementing the early detection of neuropathy in a normal clinical setting.

548. 3D Image Segmentation of Cells for Localized F/B SHG Analysis

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Betelhem Solomon Abay

Karissa Tilbury

Faculty Mentor: Karissa Tilbury

Abstract: Early detection campaigns for breast cancer have radically increased the number of breast cancer diagnoses each year; however, the number of women dying from metastatic breast cancer is stagnant. Increased understanding of the tumor microenvironment and the cellular and acellular signaling cues associated with tumor promotion and metastasis. Here we develop a 3D breast tumor model of breast cancer cells (MCF7A or MDA-MB-231) co-cultured with fibroblasts cells (cAMP activated +/-) to recapitulate the interaction of breast cancer cells and neighboring normal fibroblasts for 72 hrs. Collagen fibers were imaged using Second Harmonic Generation (SHG) imaging in both the forward and backward directions. An image analysis pipeline was developed for pixel-wise cell segmentation and the emission directionality FSHG/BSHG ratio (sensitive to phase matching and the dipole organization in the fibrillar packing at size scale of λ SHG) calculation. The analysis targeted to quantify the fibrillar organization locally at 10 pixel (3.52µm) dilation from the cell boundary. The gels with (+) cAMP fibroblasts with either MCF7A or MDA-MB-231 had lower FSHG/BSHG ratio from more packed & aligned smaller diameter fibers. The gels with (-)cAMP fibroblast with either MCF7A or MDA-MB-231 had a higher FSHG/BSHG ratio from larger diameter fibers that are less randomly packed. Both MCF7A and MDA MB 231 cancer cells induced increased remodeling in collagen when the fibroblasts are tumor-associated than (+) cAMP fibroblasts. These tumor microenvironments were characterized by higher collagen deposition, increased stiffness, dense packing, and more alignment near the cell surface which favors tumor migration to secondary locations.

549. PriCon: A Privacy Conscious System

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Maxwell Prybylo Vijayanta Jain Sepideh Ghanavati

Faculty Mentor: Sepideh Ghanavati

Abstract: Users often skip reading privacy policies to understand privacy behavior of web and mobile applications because these documents are long, complex, and ambiguous. Recent work has addressed these limitations by shortening the policy and creating conversational privacy chatbots to answer users' privacy questions. Although these work provide good information to users, it may offer inaccurate information because privacy policies often misrepresent the privacy behavior of applications. In this project continuation, we plan to expand on our previous work and create PriCon: a chatbot that responds to users' privacy questions about an application based on the privacy policy practices extracted from the privacy policy and privacy behavior captions created from an applications source code. In addition, we plan to release our corpus of privacy policies, language embedding, and trained models.

550. Effects of Salinity Changes on Freshwater and Moderately Saline Biofilters

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Eliza Costigan Jean MacRae

Faculty Mentor: Jean MacRae

Abstract: Fish typically excrete nitrogen in the form of ammonia, which is toxic to most organisms even at low concentrations. In recirculating aquaculture systems (RAS), where only 10% of the system water is exchanged per day, the ammonia-nitrogen produced by fish must be converted to the less toxic nitrate-nitrogen before recirculation. The microbes that perform this conversion, nitrifiers, are notoriously sensitive to changes in environment, especially changes in salinity. This can be an issue in RAS when transitioning anadromous fish such as Atlantic salmon from freshwater to saltwater over their lifetimes. However, acclimation to a small amount of salinity before transition to a higher salinity may help biofilters recover from these changes. A series of experiments was performed on both freshwater and moderately saline (3 ppt) biofilters to assess their respective levels of recovery after an abrupt change in salinity (3, 20, and 33 ppt). Tests were run for a two-week period in which the nitrification rates were monitored. It was found that the nitrification rate in the freshwater biofilters recovered by approximately 91% in two weeks after a shift to 3 ppt water, and showed no recovery after shifting to 20 and 33 ppt water. The nitrification rate in the moderately saline filters recovered by about 11% in two weeks after a shift to 20 ppt water, and did not recover at all in 33 ppt water. These results indicate that it is possible to prepare biofilters for a major, abrupt salinity shift using a low level of salinity.

551. Thermally Protected Phone Case

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Aimee Whitman Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: My capstone project idea is to design a phone case that defends devices against temperatures of the hot summers and cold winters to keep the hardware and batteries of mobile devices from being permanently damaged. Oftentimes, if a phone is left out in the cold for too long, users report that their charge drains to almost nothing in minimal time with minimal usage.

Likewise, when using a phone at the beach, leaving it in the car, etc., the phone will turn black and not be usable due to overheating. Therefore, using materials inspired by NASA spacesuits, household kitchenware, and thermally-protected clothing, I want to design a sleek, durable, and lightweight phone case that is thermally regulated on the inside. **552.** Air Dehumidification Using CNC/PDMS Dense Membrane at Elevated Temperatures and Relative Humidities

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Nasim Alikhani

Ling Li

Faculty Mentor: Ling Li

Abstract: Moisture-selective membrane technology shows great potential in conventional wood drying processes as it provides a solution to recycle the thermal energy stored in the exhaust air vented from the kiln. This study aimed to develop a high-performance cellulose nanocrystal (CNC) modified PDMS composite membrane material to efficiently separate water vapor from the moist warm air at a high temperature, up to 80°C. Three objectives were to 1) determine the optimal ratio of CNC as an additive to PDMS polymer; 2) fabricate a CNC/PDMS/PAN composite membrane material; 3) evaluate the permeability and selectivity of water vapor and Nitrogen gas at high temperatures (up to 80°C), and different relative humidity (RH) levels. Weight concentrations of CNC in PDMS were 0%, 1%, 2%, 3%, 4%, and 6%. The water vapor permeability of the membrane samples was measured with the Payne diffusion cell, coupled with the Dynamic Vapor Sorption (DVS) instrument, and the nitrogen gas permeability with a gas permeation cell. The selectivity was obtained from the ratio of water vapor permeability to nitrogen gas permeability. The results showed that the optimal addition of 2% CNC to the PDMS increases the water vapor permeability of the membrane by 24.8%, 30.9%, and 11.2% at 25 °C, 50 °C, and 80 °C, respectively. The selectivity was slightly increased by up to 7.7% when 1% CNC was added. The research findings will also facilitate the application of CNC in membrane separation fields.

553. Ad Hoc Positioning in Wearable Devices

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Jacob Mealey Mike Scott

Faculty Mentor: Mike Scott

Abstract: Over the last few years wearable devices have come into the mainstream. These devices provide many benefits to many users, but are limited as they must be tethered to a cell phone. Ad-hoc networks can be leveraged to estimate relative positioning of neighboring devices. Ad-hoc positioning systems are actively being researched, but much of the research is based on stationary networks. In preliminary work we have deployed positioning systems working on small embedded devices. In the proposed work, we will develop a variation of existing work in ad-hoc networks to apply it to wearable devices through simulations to determine optimal design specifications as well as the limits of such designs.

554. Immiscible Liquid-Coated Materials for Water and Aerosol Filtration

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Justin Hardcastle ChunKi Fong Danika Evangelista Rushabh Shah Shao-Hsiang Hung Aydin Cihanoglu Caitlin Howell

Faculty Mentor: Caitlin Howell

Abstract: During the purification of water and air, the adhesion of bacteria and other foulants is an ongoing issue that leads to flux decline, and current chemical and physical cleaning methods for fouled filters can lead to filter degradation over time. In addition to being porous throughout, commonly used filtration materials such as polytetrafluoroethylene (PTFE) and polyvinylidene fluoride (PVDF) often have a textured surface that promotes the adhesion of bacteria and other contaminants. In this work, we present bioinspired liquid-coated filters as a new approach to creating filters that resist fouling. Liquid-coated filters were created by immobilizing a water immiscible liquid on the surface of commercially available synthetic filters. For water filtration tests, 0.45 µm pore diameter PTFE and PVDF filters were coated with omniphobic perfluoropolyether liquids. We measured the continuity of the surface liquid layer by testing how easily a water droplet could begin to move the surface, as well as the anti-adhesion properties of the surface liquid layer through quantifying the speed of a droplet's movement at a static angle of inclination. The results indicate that infused PTFE membranes form a superhydrophobic surface with a sliding angle of approximately 5°. Infused PTFE membranes sustained a more consistent functional liquid layer, with an approximately 75% lower sliding angle and 70% faster droplet movement at a fixed angle, than the infused PVDF. We measured the ability of the infused membranes to resist biofilm formation by incubating in growth media with Staphylococcus

epidermidis for 24 hours. Infused PVDF membranes reduced biofilm formation by approximately 25% compared to bare controls while infused PTFE membranes reduced biofilm formation by approximately 98%. Pure water permeability (PWP) experiments conducted at an applied pressure of 1.5 bar indicated that liquid-coated PVDF membranes had a statistically equivalent PWP of 2827 ± 323 L/m2-h-bar, for over 10 cycles of use, showing that the immobilized liquid is present and stable within the pores. For aerosol filtration, we tested the efficiency in capturing and releasing aerosolized Escherichia coli using liquid-coated commercial PTFE and HEPA filters. We determined that bacteria trapped on the liquid-coated filters could be removed with increased efficiency compared to bare controls. The use of liquid-coated materials in water and air purification applications opens new doors for the creation of a biointerface that resists adhesion in dynamic environments. 555. Equiptrac: Solving Equipment Management Time Usage and Cost Reporting for the ASCC

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Tyler Delargy Michael Rumohr Michael Taylor Brian Couture Spencer Campbell Terry Yoo

Faculty Mentor: Terry Yoo

Abstract: The purpose of this product is to provide equipment usage tracking and cost accounting capabilities to the ASCC. Users of this software will be both center employees, as well as administrators responsible for equipment, lab safety, and equipment cost reporting. Employees of the ASCC constantly use expensive lab equipment for various types of testing and manufacturing. Employees may be working on one or more projects, for many different highprofile clients from national labs to public and private companies and government contracts. Given that equipment has an expected lifespan and associated cost, in order to properly charge ASCC clients for work done using equipment, an equipment usage tracking system is necessary. Employees will use the created software to log date, time, and duration of use of a specific piece of equipment tied back to their name and project number they are working on. Administrators will use the software to update equipment database information and generate reports of equipment usage over various time scales and filters. In response to this problem, we have created a mobile and web application that can be accessed and used to sign in using UMaine single sign on, then check their current equipment in use, make a new entry, generate usage reports, and then access administrator functions if allowed. We also implemented an additional function beyond our requirements, a machine learning model for text recognition to automate the process of making a new equipment usage entry.

556. Starting Fresh! Gathering New Information on Freshwater Flows Pouring into Maine's Estuaries

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Hanna Cronin Sean Smith Neil Fisher

Faculty Mentor: Sean Smith

Abstract: Coastal water quality and aquatic habitat conditions are largely driven by fresh and saltwater inputs to estuaries. Information on the freshwater flows is essential for detection and prediction of problems related to coastal ecosystems, seafood industries, and public health. The monitoring and prediction of stream flows can be challenging due to complicated measurement logistics and modeling uncertainties. Here we address these challenges in the Frenchman Bay region using an ensemble of measurement approaches, followed by comparison of stream discharge time series to watershed rainfall runoff simulations. Monitoring flow in Crippen's Brook in Trenton, Maine allowed for the development of a discharge time series that is compared to the three different forecast ranges of the National Water Model (NWM) using the Nash-Sutcliffe efficiency evaluation. The measurement and post-processing of the discharge time series in the study watershed, provides a new fresh start for quantification of runoff inputs into the Bay. The flow time series provides important information for new modeling of land-sea connections and estuary hydraulic conditions, as well as a basis to expand uses of the NWM for land-sea connections affecting estuaries in the future. Results from analyses of individual storm events and extended time series indicate that the NWM is currently a relatively poor predictor of runoff (freshwater flows) in the Frenchman Bay watershed with the longest-range prediction producing the most accurate outcome. Under-prediction of flows by the NWM when compared to our measurements can be attributed to uncertainties in the meteorological and runoff components of the NWM simulations.

557. DeepReal: Exploring Methodology for 3D Streaming of Authenticated Humans

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Tyler Delargy

Terry Yoo

Faculty Mentor: Terry Yoo

Abstract: Real Time Reality is a student founded and owned startup looking to revolutionize digital interaction online. With the goal of making socialization on the internet grounded in reality, authentic, private, and secure a new technology is needed to stream authenticated real people into virtual environments for web3 and beyond. To do this, a pipeline was investigated for creating realistic true to life avatars for any person using mobile hardware. These replicas can be used as both a representation of virtual identity, and a biometric key to keep information private and secure and will be stored and managed via decentralized ledgers to insure no central control over this shared and authenticated reality. Novel combinations of methods were used to predict human body shape from several measurements and images, however, most of the investigation was into the human face and head where humans identify individuals. Preliminary results show efficacy of traditional photogrammetry in this task; however, this method produces inconsistent topology unable to be rigged for animation or stored easily as a modification of a base mesh. Therefore, further methods to use shape from shading, facial key point detection networks, human segmentation priors, and training of deep learning GAN networks are being investigated create a process that can be performed by anyone with a mobile phone to produce consistent and realistic results.

558. The Utilization of LIDAR Technology for Realistic VR Simulation

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Ethan Woods Michael Scott

Faculty Mentor: Michael Scott

Abstract: While VR is rapidly becoming a more mainstream medium for sharing experiences in a way never before seen, LIDAR technology has existed for as long as the practice of taking terrain data left the ground. With the ability of VR to provide lifelike interaction and clarity to anything imaginable, simulation has always been one of its primary utilizations, especially in the education and industry sectors. When it comes to a project in which the goal is to immerse somebody in a realistic and accurate environment mirroring that of the real world, the combination of LIDAR and VR is an attractive mixture. With these two technologies, we are working on an experience in which you are transported to a remote lake in Alaska and are get to experience and engage in the environment around you as if it were the real thing. Specifically, we are simulating this environment thousands of years ago, when animals such as mammoths still roamed its tundra. Considering the primary goal of this project is to make this experience available to kids to learn more about the process of Paleontology and the work of a Paleontologist, realism is key. Therefore, with the use of LIDAR and other technologies, we will be able to provide the most authentic experience possible, instilling in our users that what they are seeing is, in fact, real-life, and a real profession that they are engaging in.

559. Relay Assisted Wireless Energy Tansfer for Efficient Spectrum Sharing in Harsh Environments

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Sonia Naderi

Ali Abedi

Faculty Mentor: Ali Abedi

Abstract: Since the number of wireless sensing devices are increasing rapidly, the concept of energy efficiency is of high importance and will lead to high spectrum efficiency. One of the main hurdles in efficient spectrum sharing in wireless sensor networks is the problem of power management at the node level to promote longevity without polluting the spectrum, while promoting collaboration. Wireless energy transfer for powering sensor nodes in wireless sensor networks has drawn significant research attention recently especially in hard to reach areas like forests and space. Modeling the charging and power utilization processes can help with smart transmission decisions, which can eliminate unnecessary transmissions. We are considering a cooperative relay assisted system model consisting of a transmitter powered through an energy source by both direct and relay links. An energy efficient scheduling method based on artificial intelligence is proposed for the system model to determine whether to transmit data or stay silent based on the stored energy level and channel state. All theoretical results are validated by numerical simulations and verify the effectiveness of energy relaying and proposed energy efficient scheduling methods in reducing the outage probability of the system. In this work, it is proposed that the transmitter is powered using an energy source. For future work, we will consider several batteries as an energy source powered by Photovoltaic solar panel. It is clear that by increasing the number of batteries and size of the solar panel, the outage probability of the system will be decreased but it leads to increase in the cost of the system. As a result, we will solve the problem of outage probability of the system based on the number of batteries and size of the solar panel and find the optimal value of these characteristics for a defined tolerable outage probability of the system.

Arts

601. My Dance of Life: Teshuvah - To Turn Towards One's Self

Submission Type: Exhibit

Submission Category: Arts

Author(s):

Sarah Meyer-Waldo Samantha Jones

Faculty Mentor: Samantha Jones

Abstract: This project is a book of creative writing divided into three sections. Each section is accompanied by videos of original movement explorations and choreographic works. In addition, each choreographic work is set to one of the original poems from each section. The question proposed for this project is, how can I act on my insights, reflections, and thoughts as I move through life, in order to engage more fully with my own mental/conscious experience? Therefore, the intent of this project is to use the creative process as a means to engage more fully with my own mental/philosophical experience. One of the art forms utilized, which I have significant experience in, is dance, and the other one which I am a novice at is creative writing. Writing makes the thoughts and internal experiences concrete by externalizing them. Dance brings these reflections back into myself through embodiment. The creative and choreographic process involves returning to the words and the movement again and again. This constant creative and physical engagement with the written insights, reflections, and thoughts that I have as I go through life helps me to integrate them into my being so that they are an active part of me, both consciously and subconsciously, influencing how I move about the world. The integration of all three written sections progresses from a sense of brokenness, grief and loss, to one of hope, self love, and being grounded in oneself. This reflects the pattern of the Jewish calendar. During the Jewish spiritual new year, Rosh Hashanah, Jews practice teshuvah, or repentance. However teshuvah can also be translated to, turning towards oneself. Each section of this project turns towards my self, from beginning to end, and the three parts of the project as a whole do the same.

602. Sounds of Maine

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Jillian Trujillo Hernandez Justin Wolff

Faculty Mentor: Justin Wolff

Abstract: The project Sounds of Maine is an interdisciplinary virtual art installation that explores the connections between nature, sound, and artmaking. It will feature a set of drawings and sound recordings from four specific locations in Maine. The project's broad objective is to build connections between art and ecology. Specifically, I will identify locations in Maine devoid of man-made noise and create drawings in response to the sounds of nature. I will locate and record four "silent spots" in the state and then create drawings so as to transform the field recordings into imaginative works. The installation will feature each recorded sound with its matched drawing as well as information about the location, such as time of day and weather. The installation will bring awareness to the importance of preserving silent spots and to the mutual interests (preservation) and methods (observation, pencil, paper) of drawing and scientific field research.

603. Symbols of Death

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Lia Davido Susan Smith

Faculty Mentor: Susan Smith

Abstract: Art has a rich history of using symbolism to create work surrounding the themes of death and decay. Dating back to the seventeenth century this visual language served as a reminder of an individual's own mortality. The most enduring symbols of this language have been skulls and plants, the focus of the imagery in this work. This project looks to continue this tradition and research the use of traditional processes such as pyrography, burning wood in a controlled way to create an image, usually done using a heated piece of metal. Modern technology allows for these same methods of art making, using a laser engraver to burn imagery into wood. The resulting art objects will be biodegradable and eventually decay and return to the earth symbolic of our own life cycle and serve as a reminder of human, and more-than-human processes of entropy and decay.

604. Thuja occidentalis: Exploring Maine's "Tree of Life"

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Delaney Burns Andy Mauery

Faculty Mentor: Andy Mauery

Abstract: I am currently working on a series of woodblock prints that explore the forms and textures of bristlecone pine trees through abstracted imagery and patterns. I am drawn to bristlecones because they are the oldest known tree species in the world, and they have personal significance to me. However, as much as I love bristlecones, they are not found in Maine or even the Northeast. They are fascinating but I want to be able to connect with my audience here in Maine. As a spin-off of this project, I will be creating a smaller series of 20" by 30" woodblock prints that explore the Northern White Cedar. These trees are one of the oldest species found in New England and also have personal significance to me. The goal of this project is to explore the intersections of art and science. It is also to explore the importance of Maine forests, specifically focusing on the role of Northern White Cedars.

605. 20-Sided Story

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Stella Cashman Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: One of Stella's passions in life is gaming. Two types of gaming she really enjoys are text-based adventure games and Dungeons & Dragons (D&D). Both games have yielded impressive storytelling, without the need for fancy graphics and gratuitous violence. Stella intends to make a text-based game with D&D mechanics, while also correcting some of the flaws the game has regarding race and identity. It will follow the story of a group of adventurers sent to a cave system to retrieve an artifact for a generous benefactor who has agreed to pay them for it. Once they are inside the cave system, though, they get a lot more than they bargained for, including a bad actor within the party. The ending of the story will depend on not only the player's choices, but also their statistics and the luck of the "dice." Hopefully, with this game, Stella will not only appeal to gamers tired of the current gaming climate, but also people who love D&D and people who've never played D&D, but would appreciate the spirit of it.

606. 3D Printing Fantasy Cosplay Armor

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Carly Cornish Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: My capstone idea is to take drawings that I have done for a character in my trilogy and utilize 3D printing to create a suit of armor to use as props for cosplay. My trilogy is part of the high fantasy genre, with honorable and ruthless warriors who go into battle with the armor that I designed. I've been working on the most recent edit of the trilogy for at least five years. Since I'm incredibly invested in this concept and storyline I thought it would be amazing to try and build what they wear. I will be using PETG because it holds up better in sunlight and heat than other materials and doesn't require a heated bed plate as ABS does.

From sketches to 3D modeling to printing and painting, the entire process will be recorded and made into tutorials. This will give others a better understanding of the design and 3D printing process. The tutorials will also help others with the know-how and courage to do something similar. Projects like these can be daunting, so I hope to make it more manageable with these tutorials and time-lapses. Tutorials will be posted on different social media platforms, such as Vimeo, Instagram, Facebook, and YouTube.

607. Swiper

Submission Type: Exhibit

Submission Category: Engineering and Information Sciences

Author(s):

Kaitlyn Stewart Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: I want to create an app that will be the new hub for finding second-hand clothing—an app like Tinder but for shopping. The user will be shown a picture of a piece of clothing; if the user likes it they can swipe right to add it to their cart. Users can also swipe left if they don't like it; the app will slowly learn what type of clothes the user likes. There will also be an option to save it for later when the user is looking at their cart. My main goal for this project is to help reduce waste when it comes to old clothing and slow the effects of consumerism on the Earth.

608. Andante et Scherzo

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Stephanie Winslow Elizabeth Downing

Faculty Mentor: Elizabeth Downing

Abstract: I would like to perform Andante et Scherzo by Louis Ganne. Born in 1862, the composer studied at the Paris Conservatory, and the piece was written for an annual competition there in 1901, and was used again in 1905 and 1939 for examinations. It is a less performed work in the set of flute solos with piano accompaniment known as "Flute Music by French Composers." He was most prolifically a composer of operas and operettas, but this underrepresented gem shines light on late French romanticism at the turn of the century.

609. The Journey of Perseverance - A Rover's Perspective: Phase 2-Enroute to Landing

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Anna Soule Shawn Laatsch

Faculty Mentor: Shawn Laatsch

Abstract: The Journey of Perseverance – A Rover's Perspective is an on-going, large-scale, multiple-phase, Socially-Engaged Art & Science Installation Series, offering a personified visual narrative of Perseverance Rover's perspective in engagement with its creators, its journey into space towards the Red Planet, its exciting landing onto Mars, and its many explorations and adventures while in two-way communications with Mission Control. With plenty of light-hearted humor mixed in with scientific facts and the wonder of space and planetary exploration, this project will result in the prototyping and creation of an installation package with at least five deliverables for dissemination to "the public," upon completion of the Research and Development associated with each phase. Phase 2: Enroute to Landing has a targeted exhibition date of late January/early February of 2023 following the expected exhibition for Phase 1: Inception to Launch slated for some time in October 2022.

These 5-part deliverables include: a video/animation short projection-mapped onto the 360-dome at the Planetarium on campus; a "Art-i-Fact" Sculpture with Artist Book; a series of Limited-Edition Artist Multiples—the Family-Friendly Activity Kit and the Deluxe Collector's Edition; a series of fun and educational "STEAM Workshops-In-A-Box" offering a mixture of related interactive activities; and a 'Mars Mission Control Ambassador Passport' for viewers to collect artist-designed mission patches/stickers specific to each phase's branding campaign. Installation and dissemination of these deliverables will span different locations on- and off-campus for an explorative scavenger-hunt-style viewing with the 'ambassador passport' in hand, also allowing for potential state- and nation-wide exhibitions in the future. **610.** Your Embodied Presence and its Inherent Impact on the Relations Existing in your Present Environment

Submission Type: Exhibit

Submission Category: Arts

Author(s):

Katarina Hoeger Nathaniel Aldrich

Faculty Mentor: Nathaniel Aldrich

Abstract: Embodiment in space is intrinsic to human existence. As an embodied entity, there are multiple relations that link us with our environments. Through these relations, we impact the current and future states of whatever makes up our present surroundings. At minimum, our presence leaves visual and sonic impressions on the current environment. We ourselves become another color in the wall of colors that are seen through another's eyes, our body leaves physical evidence through footprints on soggy ground, and our breath intrudes into others' sonic landscapes. The impact of our presence is unavoidable and impacts the future happenings in our current environments in difficult to trace ways.

Modern technology allows for easy surveillance of a space. With cameras and microphones, we can pick up the audio and visual changes from the recording device's perspective. Using this data, we can identify the changes in audio and visual relations in the space, artistically reinterpret the chosen relations, and then broadcast them via speakers and projectors back into the environment from which they were gathered. It is one way to examine how relations morph and create the future of a space.

This work provides a participant an arena within which to highlight their present relations with the audio and visual happenings of their current locale. It provides groundwork to start asking questions about what it means to be embodied and by subtly asking the participants to contemplate their individual relations to their surroundings.

611. Purely Human Project

Submission Type: Exhibit

Submission Category: Arts

Author(s):

Jacob Hotaling Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: Jake Hotaling is an upcoming and award-winning director, cinematographer, and founder of the Purely Human Project. The Purely Human Project collects anonymous notes written by audiences all around the world and turns them into films. These videos range from 15-60 seconds and are posted in TikTok in the form of a series that fits today's platforms. These notes are collected through social media and on my personal portfolio website. The motto is "Notes made by you, films made by me, all words are purely human." Every note is authentically written and expressed by individuals. Jake's overall goal is to capture genuine feelings and connect strangers with one another everywhere.

612. Music Video/Project

Submission Type: Poster

Submission Category: Arts

Author(s):

Dillon Fletcher Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract:

My capstone idea is the Music and Video project. Using the beats I created and the lyrics I wrote, through social media and personal connections, I will put together a video of people singing the song I have created. The worked to create multiple beats, and well as written seven songs. At the moment the genre is a mix of hip/hop, rock, pop, and RnB. Creating the music, beats, and lyrics will pose the question of how to show my work to make it more engaging? I will make a music video for the songs. I will also have a music video where people will sing the song I created. Along with the music, the project will also feature artwork, such as an album cover. I will be collaborating with people that have a professional music-creating background. The people I will collaborate with will help with the mixing and mastering as well as achieving the desired sound I am looking for. The people involved and to have people participate in singing the lyrics over the beat. I have also been posting to Instagram (https://www.instagram.com/fletchmusicpro) to gain a wider audience and point them in the direction of the TikTok videos.

613. Sergei Rachmaninoff's Interpretive Architecture

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Kimberly Hunt Phillip Silver

Faculty Mentor: Phillip Silver

Abstract: Pianists strive to transform the notes of a musical score into an interpretation with coherence and purpose – a compelling story. Musical notes, like the text of a speech, are only a shadow of the story a composer seeks to tell (Rachmaninoff 1913, 219). Sergei Rachmaninoff (1873-1943) rose to artistic heights in composition and conducting during Russia's Silver Age (1890-1920). In 1918, Rachmaninoff left Russia and channeled these perspectives into crafting piano interpretations "from the inside, as an organic and felt creative process" (Cardus 1966). This study identified Rachmaninoff's interpretive principles from primary sources (writings, letters, scores, recordings) of Rachmaninoff and his mentor Alexander Siloti (1863-1945) at the Library of Congress, with secondary interviews and recordings providing additional context. An interpretive architecture markup was developed, applied to scores, and validated against Rachmaninoff's recordings. These annotated scores illustrate how Rachmaninoff's interpretive architecture aligns with each composition's structural design and acts as a scaffold for his pianistic tone renderings. Additional repertoire annotations exemplify how pianists can develop an interpretive architecture by deconstructing a composition to reveal the composer's design then reconstructing this design through tone rendering. The field of piano performance studies continues to seek convergence between the approaches of the music analyst and the pianist (McClelland 2003). For the music analyst, this study provides principles and markup for analyzing pianistic interpretations. For the pianist, it provides a toolkit of practical markings to clarify interpretive decisions and sharpen awareness of elements that have the potential to heighten the coherence and purpose of a performance.

References

Cardus, Neville. "Rachmaninoff." In The Delights of Music: A Critic's Choice. London: Victor

Gollancz, 1966.

McClelland, Ryan. "Performance and Analysis Studies: An Overview and Bibliography." Indiana Theory Review 24, no. 4 (2003): 95-106. Accessed April 1 2021. https://www.jstor.org/stable/24046462.

Rachmaninoff, Sergei. "Essentials of Artistic Playing." In Great Pianists on Piano Playing: Study Talks with Foremost Virtuosos, edited by James Francis Cooke, 206-220. Theo Presser Company, 1913. 614. Specious Locus

Submission Type: Poster

Submission Category: Arts

Author(s):

Luke McKinney Susan Smith

Faculty Mentor: Susan Smith

Abstract:

Specious Locus is a body of work that fuses current scientific theories with a mixture of artistic mediums to investigate and communicate concepts relating to perception, cognition, the existence of time, the structures of place, and ultimately climate change. The research is grounded in theories put forth by some of the world's foremost scientists in neuroscience. quantum theory, and philosophy including A. Seth's Constructed Conciousness, D. Buonomano's Brain Bugs, C. Rovelli's definition of time as "emotional responses to local change" and G. Harman's Object Oriented Onotology.

Accepting that we are dealing with a post-modern hangover that fractured the objectivity of existence, my practice probes the procedures our biology uses to form and allow us to function within our realities and adapts those procedures to create artistic processes. These processes generate derivative objects that give alternate access points to the understanding of these innovative ideas.

The materials used in generating these artworks center around images of wilderness— often referred to as "nature". Wilderness images allow the viewer to personally relate to the content removing cultural commentary. When symbols of humanity do make appearances they emerge from the negative space to make pointed comments relating to humanity's place within the complex ecosystem we are a part of which underlines the larger concept— we cannot understand our existence if we don't have a habitat to exist within.

Submission Type: Poster

Submission Category: Arts

Author(s):

Conner Ingalls Jordan Jawdat Nathaniel Aldrich

Faculty Mentor: Nathaniel Aldrich

Abstract: For our capstone project, we are creating a digital instrument called the "Slap-Box." The Slap-Box is a force sensitive MIDI controller that is played like a drum. Using sensors that read data from pressure, the user will be able to manipulate sound simply by slapping or tapping one of the faces on the instrument. We are creating this instrument as a unique way to make sounds and have fun. On top of including pressure-sensitive sensors, the Slap-Box will include an audio jack that can be used to connect to a speaker of the user's choice. For audio manipulation, the Slap-Box includes buttons on its top face that control the pitch and duration of the note, and a potentiometer to control amplitude. We have prioritized simplicity in our design, and have aimed to create something easy enough to play that anyone can do it. The Slap-Box is a table-top device controlled by an Arduino UNO, with the audio being written in Max/MSP. This is a fun learning experience created to appeal to a large audience. Everyone from professional musicians to toddlers can find a way to enjoy playing with the Slap-Box.

616. Lake Sayram Cantilena

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Ruixin Niu

Laura Artesani

Faculty Mentor: Laura Artesani

Abstract: This piece is written in 1979 by Chinese composer HUANG Huwei, after visiting Sayram Lake.

Sayram Lake, is the largest and highest alpine lake in northwest China Region, very close to Kazakhstan.

In Kazakh language, Sayram means "blessing", which concerns all people passing by along the Silk Road. In Ancient Mongolian, Sayram Lake was called "western clean sea" or "Sayram Zhuoer," meaning the "lake on the mountain ridge."

There is a legendary love story about The Sayram Lake. It used to be converged by tears of a young couple committing suicide for love.

Sayram Lake is a fairyland with fantastic natural scenery. It is like a brilliant emerald inlaid in the basin surrounded by Tianshan Mountain.

The composer tried to translate with music the beauty of this ancient unique place.

It is presented in a viola and piano version, the viola being closer to the human voice although it plays a lot as well in the top register of the instrument.

I am happy to present this piece since it will be part in one way or another of the IPhD work that I will present in a few years, the subject being around the pentatonic music along the Silk Road.

617. Creating Cross-Cultural Connections: Innovations in Theatre for a Pandemic Age

Submission Type: Poster Submission Category: Arts

Author(s):

Kathryn Luck Neily Raymond Rosalie Purvis

Faculty Mentor: Rosalie Purvis

Abstract: With the pandemic forcing the creative sector online, we've had to find new ways to connect, and theatre—which is all about connection—has rapidly changed form. How can you fit a theatrical performance into a small box on a screen? We have an answer: our project focuses on our dramaturgical work for a multicultural, multimedia performance of Anon(ymous), by Naomi Iizuka, in Fall 2021. We took those small boxes and blew them open, fabricating a bond between actors onstage in Maine and onscreen across the world—from skate parks in Massachusetts to rehearsal rooms in Kolkata, India.

Anon(ymous) is a retelling of the Odyssey through the eyes of a refugee, searching for the mother he lost in childhood. We explored how the story resonates with both its classical Greek source and with the horrors of the modern refugee crisis. We produced a documentary about the process of staging this unique production, interviewing directors, production team, and actors from both Maine and Kolkata. Our project highlights how this pandemic-era experiment grew from a seed of an idea to a full-fledged production.

618. Rotoscoping Classic Films

Submission Type: Exhibit

Submission Category: Arts

Author(s):

Peter Vigoda Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: For my capstone project I intend to create rotoscoped scenes from old media. This project will utilize Silver Age media with a new media technique to create an entirely new format of its own. Rotoscoped films are used as a substitute for traditional animation; the process is done by using base footage as a guide for frame by frame animation to produce more realistic movement. Today this technique is generally used for high quality artistic films or low quality cartoons creation. How my idea differs from the traditional uses of rotoscoping is by using old dated media as base footage. Today media is produced daily in huge quantities and at a quality so high old legacy media cannot compete. The problem I see is the newer generations of people unaware of the media that built up to the state they are currently at. Some of the most socially impactful media is from the stone ages of media and is more relevant than ever but unheard of by newer generations, i.e. *To Kill A Mockingbird*, *Metropolis*, *The Great Dictator*. My plan is to bring old forgotten media that is still relevant today to the modern day of animation film.
619. Changes in the Film Industry - The Rise of Commercialized Films

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Corey Whitman Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: My project is a video essay that discusses the state of the film industry. Since the COVID-19 pandemic, the film industry has undergone major changes in a very short amount of time, from theaters closing down, streaming services becoming major movie production studios, to established titles being preferred over new IPs, and many more. These topics will all be fully discussed and analyzed over the course of my video essay.

620. Invaded

Submission Type: Exhibit

Submission Category: Arts

Author(s):

Jessica Brainerd Susan Smith

Faculty Mentor: Susan Smith

Abstract: For the Graduate Exposition Student Symposium, I am submitting my piece "Invaded." This is a garment cum wearable piece of art, the final project from IMD 530, Eco Feminism. In October of 2021, Banu Subramaniam delivered a lecture on "Decolonizing Botany," which included themes around the complex ideas of invasive species of plants. This wearable piece is displayed on a dress form, and is primarily composed of fabric, wire, and thread. The title "Invaded" refers to the invasive plant species, kudzu, which was the inspiration. When driving through the southeastern United States, it's quite common to pass what appear to be waves of green - entire landscapes that seem to have been consumed by the invasive plant, kudzu, a perennial vine intentionally introduced to the US from Japan in 1876, and was widely used first as a decorative plant, then in an attempt to stop soil erosion in the early 20th century, before eventually being recognized as a "noxious weed" in the 1970s. An established kudzu plant can grow up to 1 foot per day, strangling out native plants, and taking over entire ecosystems. The negative impact of the plant is significant, but like most of life, it's not a simple matter of bad vs. good. The majority of the plant is edible and has been found to have anti-inflammatory properties; the delicate purple flowers are lovely and fragrant. This piece is a wearable representation of not just the vines and leaves, but also the roots, which trail behind the form. The individual dressed in the piece is largely exposed, wearing a draped dress of sheer material, with vines climbing from the floor to completely obscure the chest and face with pliable leaves.

621. Stardust Trails: A Sci-fi Audio Drama Podcast

Submission Type: Exhibit

Submission Category: Arts

Author(s):

Robert Hebert Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: This project is a pilot episode for a podcast called Stardust Trails. Stardust Trails is a sci-fi audio drama podcast following the adventures of space-faring bounty hunters Ersten and Albany and their soon-to-be-adopted children from earth, Isaac and Maggie. Deeply inspired by shows like Adventure Time and Cowboy Bebop, Stardust Trails is a story about found family, coming of age, and space exploring fun! Each episode will be between 15-20 minutes long with the first episode most likely being around 17 once editing is done. The pilot is voice acted with a full cast.If the pilot works out, it'll probably expand into a full series.

622. Performance of "Fantaisie Pastorale Hongroise", by Franz Doppler

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Megan Howell Elizabeth Downing

Faculty Mentor: Elizabeth Downing

Abstract: To showcase my research, I will be performing Franz Doppler's "Fantaisie Pastorale Hongroise". The work, inspired by Hungarian folksongs, begins in a minor key as a slow, theatrical melody with expressive flourishes showcasing the full range of the instrument. The piece accelerates, resembling a dance by the end, taking the soloist through drastic changes in register, dynamics, and tempo.

I will take many aspects of playing into consideration. Long phrases in the slow sections will require strong air support to keep the instrument resonating in the low register. The 1/32 and 1/64 note flourishes need similar attention, as they frequently pass from the upper to the lower register. In faster, more technical sections, adjusting my aperture will provide more flexibility when moving quickly between notes in sixteenth note passages, keeping everything clear and audible.

The challenge when playing this piece is maintaining the correct style throughout. While playing fast, technically challenging pieces is something I enjoy, unlocking the "performer" in me has proven to be challenging at times. This piece calls for the performer to present a stylistically traditional Hungarian performance, taking dramatic pauses, and playing with a full sound. When preparing pieces like this, Professor Downing and I discussed finding a new persona to play on stage. While getting the technique right is integral to the success of the piece, so is the drama, and the character. Only when I can combine all elements will I have created a successful performance of Doppler's "Fantaisie Pastorale Hongroise".

623. What Sustains You

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Rori Smith Susan Smith

Faculty Mentor: Susan Smith

Abstract: What Sustains You is video documentation of a collective ritual initiated by Rori Smith and performed/enacted by members of IMD 530 Performative Ritual. In this performance, participants were invited to be witnessed as they responded in writing to the question, "what sustains you?" Participants were offered both ink and water with which to write, choosing ink for public responses and water for personal, private reflection. The question "what sustains you?" elicited responses from participants that include themes of activity, body, environment, ethics and subjectivity. The documentation of What Sustains You is accompanied by narration from Smith reflecting on the performance as a means for each participant to attune to that with which they are in ongoing relationship. Drawing care ethics and phenomenology into conversation, Smith argues for performance contexts like What Sustains You as a model for training somatic attention, fostering receptivity and considering the relational dynamics of sustainable systems. 624. Brother Cage

Submission Type: Virtual Presentation

Submission Category: Arts

Author(s):

Ruixin Niu Susan Smith

Faculty Mentor: Susan Smith

Abstract: Revisiting music from the past with different approaches can have extraordinary results.

In Gustav Mahler's Symphony No.1 "Titan", the composer changed the folk-tune "Brother John" to a funeral march by changing the tonality from major to minor, and slowing down the tempo.

To continue this "revisiting" idea, I chose all 64 bars from this movement which used the tune of minor version "Brother John", and re-ordered those bars by drawing lots in a Taoist way - I Ching.

The placement of each hexagram on each bamboo stick is based on the different directions of the original systems of Eight Trigrams (Bagua).

The title of this movie comes from the folk song "Brother John" which is used by Mahler. "Brother John" also known in French as "Frère Jacques", is a nursery rhyme of French origin. By reversing the consonants and vowels, we can get "Cage" from "Jacques", a tribute to one of the most avant-garde composers, artists -- John Cage.

Because Gustav Mahler himself included ancient Chinese poetry in his Symphony No.10, I felt like combining I Ching methodology with unexpected order of 64 bars of Mahler's short passage of his Symphony No.1, presenting the music in a different and unique way.

Before the deconstruction starts, the first 8 bars appear as in the original work.

625. Lore; a College Memoir App

Submission Type: Poster

Submission Category: Arts

Author(s):

Christiana Mosca Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: Every college student has a story, and memories they want to share inside of them. My mobile app is a specific platform for college students to share, and browse other students' stories, and reflect on the college experience. My app's name derives from the word Folklore.

The app itself has an old-school, nostalgic feel to it. The graphic/ UX design of the app is inspired by hand-written notes, diaries, and plaid school uniform textures. It is a comforting space where students can write their college stories, along with visual media attached (photos, videos, graphics, drawings etc.) From here, other students can browse the stories posted. This app is social media only for college content, students, and alumni.

The process of sharing and reading other college students' memoirs can be therapeutic. The self-expression aspect of sharing experiences validates the user's emotions. Reading peers' stories can comfort the user as well. This is because students can find other students' stories relatable. In transformative times, students can realize that they aren't alone.

College is a time of growth, and learning. Students grow through their experiences in, and out of the classroom. Having a handy mobile app where students can jot down their thoughts, and experiences can be special.

Social Sciences and Humanities

701. Exposure to COVID-19-related Stress and Gender Moderate the Relationship Between Social Media Use and Depression in Late Adolescence

Submission Type: Virtual Presentation Submission Category: Social Sciences and Humanities

Author(s):

Emily Scarpulla

Cynthia Erdley

Faculty Mentor: Cynthia Erdley

Abstract: The COVID-19 pandemic has created many mental health difficulties for individuals around the world, with adolescents being particularly vulnerable. A primary factor influencing mental health outcomes is the ability to maintain interpersonal connectivity, which has been challenged by the pandemic and is likely related to the recent surge of internalizing disorders. Even those seeking to maintain social connections through technology use have shown increased vulnerability to depression, especially when they have other risk factors. This indicates that connection through technology may not be sufficient and may actually increase risk for depression. The present study examined whether COVID-19-related stress, as well as gender, strengthen the association between social media use and depressive symptoms. Participants were 171 undergraduate students who completed a series of self-report measures to determine experience with COVID-19-related stressors, social media use operationalized as time spent on phone applications considered Social by iPhones Screen Time application, and depressive symptoms. Results showed that exposure to COVID-19-related stressors moderated the relationship between social media use and depressive symptoms, such that increased exposure to COVID-19-related stressors strengthened the relationship between increased time on social media and higher rates of depressive symptoms. Additionally, gender moderated the social media use/depressive symptom relationship, with identifying as female strengthening this association. These findings suggest that those experiencing higher levels of COVID-19-related stressors, as well as females, are at greater risk for depressive symptoms the more frequently they use social media.

702. How Physical Activity Implementation Strategies Have Changed During the Covid-19 Pandemic in Schools Enrolled in the Let's Go! Program

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Alexandra Peary Kelley Strout Kathryn Robinson Mimi Killinger Jennifer McNulty Jen Bonnet

Faculty Mentor: Kelley Strout

Abstract: Childhood obesity is a serious public health issue in the United States. Many children fail to meet the recommended daily physical activity of 60 minutes. Poor metabolic health at a young age puts children and adolescents at a significantly higher risk of developing chronic health issues in adulthood. With the potential to further exacerbate the obesity epidemic, the onset of the Covid-19 pandemic challenged students' abilities to participate in structured physical activity, such as recess and physical education, due to school closures, strict social distancing guidelines, and hybrid or remote models of learning. This lack of structure and opportunities for physical activity warrants further investigation into how the Covid-19 pandemic has impacted school-aged children. The purpose of this qualitative secondary analysis was to determine how the pandemic shaped physical activity implementation strategies. The sample included 360 schools who participated in the Let's Go! Program, a nationally recognized obesity prevention program serving Maine and Mount Washington Valley, New Hampshire. Results indicate that staff demonstrated their commitment to students' welfare and education during the 2020-2021 school year by not only attempting to maintain normalcy under strict Covid-19 guidelines, but also creating innovative opportunities for students to participate in physical activity and demonstrating optimism in the face of adversity. These findings indicate that physical activity strategies employed by schools during the Covid-19 pandemic should be

capitalized on in future physical activity strategy plans and provide insight into student and staff reflection on the importance of health and wellbeing during this unprecedented time.

703. Palestine: The Idea Versus the Reality for Foreigners and on the Homefront

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Margaret Campbell Kara Peruccio

Faculty Mentor: Kara Peruccio

Abstract: During the early 20th century, Palestinian urban and rural life changed in the wake of defensive developmentalism and imperialism. World War I accelerated this process with foreign intervention and changing geographical borders. Taking a specific look into the Sykes-Picot Agreement (1916), the Balfour Declaration (1917), and British military involvement in the region will show the event from both a British and a Palestinian lens which is crucial to the idea and the reality of what Palestine was. Analyzing several primary and secondary sources looking at and from the period of 1914-1918 that include diplomatic documents and a diary from an Ottoman Palestinian soldier, provide important insights into Zionist hopes, what it was like in Palestine, and direct British involvement. The war is unpacked to understand the changing control of Palestine and the new vision and reality that were a result of World War I. This explores the implications of the Sykes-Picot Agreement, the Balfour Declaration, how the homefront suffered and persevered during war, the scope of British influence in the region, and investigates understanding the importance of Palestine for Western powers such as Great Britain and the United States. The idea and reality of Palestine had strategic importance for those outside of the land. As a result of these findings, the Middle East, especially Palestine, should not be considered part of the periphery of war. There were large ramifications for countries besides the Entente. Foreign intervention created a new definition of Palestine, which altered the world view of Palestine and the view for those on the homefront.

704. Communication Goals and Practices of Trans- and Gender Non-conforming Individuals and Their Impact on Mental Health

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Willow Wind Liliana Herakova

Faculty Mentor: Liliana Herakova

Abstract: Through a mixed methods design, this study examined the communication goals and practices of transgender, non-binary, and otherwise gender non-conforming (TGNC) individuals and the connections between such practices and mental health. The study was informed by co-cultural theory which proposes that members of marginalized groups (co-cultures) - such as TGNC individuals - engage in communication with the dominant group with specific preferred approaches and outcomes in mind (Orbe, 1997). An online survey was conducted to study the relationships between communication experiences, community connectivity, gender affirmation, and feelings of depression and anxiety. Identifying oneself as non-normative was linked to self-reported negative mental health outcomes. Additionally, 11 TGNC identifying individuals were interviewed about their gender experiences within a dominant gender-binary system. Findings suggested that TGNC individuals are hyper-aware of communication contexts and use communication defensively in order to avoid/minimize othering. While an overall aspiration for a dominant culture that would accommodate to non-binary gender experiences and identities was expressed, a more pressing desire to set gender aside and foster feelings of "normalcy" was observed through enacted TGNC assimilation. These results have implications for building TGNC-affirming environments through integration of gender queer recognition in syllabi statements and expansion of gender inclusive regular activity programming (e.g., student clubs) that prioritizes positive community building over discussions of identity in which the negotiation of gender can become burdensome.

705. A Content Analysis of Diversity in Publisher's Weekly Top Childrens books from 2000 to 2020

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Alyson Thompson Emily Blackwell Emma Hood

Faculty Mentor: Sandra L. Caron

Abstract: Our research team was interested in examining how diversity is portrayed in children's books. Books are one of the tools used to develop children's language. They are also the way children come to understand themselves and the world around them. We chose to examine the top books identified by Publishers Weekly for children ages 5-10 years old across a 20-year period. We were interested in examining the range of diversity in the content of those children's books identified each year as "The Best" and whether this diversity changed across time. Method: This study involved a content analysis of early childhood books listed by Publishers Weekly as the "Best Books" of 2000, 2005, 2010, 2015, and 2020. Areas of diversity included race/ethnicity, gender, sexual orientation, family forms, disability, and religion. We specifically read the children's books with these key aspects of diversity in mind. We read and coded the content of a total of 71 books. We identified key themes in the top books for each year as well as examined these themes across the years.

Findings: We found that in almost every category of diversity, with the exceptions of sexual orientation and family forms, there was a steady increase in diversity presented in the top children's books from 2000 through 2020. The areas of increased diversity included race/ethnicity, gender, disability, and religion. Implications will be discussed for authors and parents.

706. Investigating the Effects of Labor Policy on Student-Employees at the University of Maine

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Kaitlyn Ridley Au-Lionne Agatako Tamra Benson Benjamin Cotton Collin Rhoades-Doyle Robert Glover

Faculty Mentor: Robert Glover

Abstract: Research suggests that undergraduate students are a relatively vulnerable economic population within the campus workforce, generally receiving lower wages, having fewer formal protections, and less of a formal institutional voice. Thus, it is critically important to be intentional in seeking their perspectives in building equitable, inclusive workplaces. This study aims to better understand the experiences of undergraduate student-employees working at the University of Maine. Specifically, we want to examine a) the socio-demographic factors that drive undergraduates to work while pursuing higher education, b) UMaine student employees' self-reported attitudes towards current University working conditions (hours, wages, and job satisfaction) and c) the impacts of student employment on their well-being and academic performance.

To address these topics, our research team is deploying an online survey to students of the University of Maine who are employed both on- and off-campus, through a partnership with the Office of Student Employment. We will also be supplementing our survey data by interviewing several students recruited from the survey sample. Our research will provide baseline data regarding UMaine students' attitudes towards current university working conditions and factors that drive students to work while attending university, as well as how student employment impacts their lives and academic performance. These data will enrich our understanding of working conditions at the University of Maine that may also be present in similar state schools.

This study could also guide subsequent, more focused steps to address student employment concerns and providing additional resources and support for employed undergraduate students.

707. A Content Analysis of Apps for Children Under Age 2

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Mikayla True Adam Dawe Caroline Kourafas

Faculty Mentor: Sandra L. Caron

Abstract: Our research involved a content analysis of the top apps marketed to infants to 2 year olds. We were particularly interested in looking at the purpose of the app and gender messages to understand the early messaging young children are receiving from such apps.

Method: The content analysis involved selecting the top 30 free apps for infants to 2 years old. Each research team member downloaded and noted the content of each app. Initial coding was based on purpose (educational vs entertainment), and gender messaging, based on such things as colors used, characters, activity, and voices. These individual codes were compared, differences discussed, and final coding of apps in terms of purpose (educational vs entertainment) and gender messaging (gendered or gender neutral) was determined.

Findings: The majority of the apps were described by their developer as educational. However, this self-proclaimed purpose was not supported when our research team coded the 30 apps. While most were coded as Educational, they were not appropriate for children under 2 in terms of teaching complex topics like spelling, adding, and word identification. Only 5 were coded as Entertainment. Of the top 30 apps for infants to 2 year olds, we determined half (50%; n=15) were Gendered apps (reinforcing traditional stereotypes of boys and girls) and the other half (50%; n=15) were Gender Neutral apps. The findings offer important implications for parents.

708. The Effects of Affect and Sleep Quality on Cognition in College Students

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Lindsey Lagerstrom Jennifer Thompson Taylor McMillan Fayeza Ahmed

Faculty Mentor: Fayeza Ahmed

Abstract: Affect and sleep have shown to individually impact cognitive performance across the lifespan1,2; additionally, recent research has demonstrated that these two variables may interact with each other3,4. Most research on these topics focus on clinical samples; less is known about healthy, cognitively-unimpaired adults. The purpose of this study is to better understand the relationship between affect (both positive and negative) and sleep quality, and how these two variables interplay in relation to cognitive performance within a young adult, healthy, cognitively un-impaired sample. This study aims to examine both affect and sleep quality in young adults, and their relation to cognitive performance. College-aged participants (N = 113) were recruited from the Middle Age: Cognition, Activity, and Health study database, which included measures of cognition, motor/sensory activities and cardiovascular health. Additionally, affect and sleep quality were both assessed through self-report questionnaires (the Positive and Negative Affect Scale and Pittsburgh Sleep Quality Index, respectively). Analysis comparing varying levels of affect and sleep quality to cognition is in progress. This study may inform intervention targets to help students better succeed within an academically driven and cognitively demanding environment.

Acknowledgements: This project is part of a larger study of the faculty mentor.

709. Effects of Religious and Science Identity on Compatibility

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Darby Casey Sally B. Barker Jordan P. LaBouff

Faculty Mentor: Jordan P. LaBouff

Abstract: Science and religion sometimes appear to clash: for example, some religious organizations reject COVID-19 restrictions on religious grounds. However, many people, like millions of religious scientists, see science and religion as perfectly compatible. The purpose of this study is to examine how people who identify as religious and people who identify as scientists think about science and religion as compatible or in conflict. We hypothesized and found that UMaine students higher in religious commitment saw science and religion as more compatible, whereas people higher in commitment to science saw science and religion as more in conflict. We also investigated differences between Honors and NonHonors students, finding that students in the UMaine Honors program were more likely to both have a stronger science identity and see science and religion as more in conflict, as compared to the non-honors group, which saw them as more compatible.

710. Miss USA Meets Feminism: A Qualitative Study Exploring Contestants' Thoughts on Feminism

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Julia Van Steenberghe

Faculty Mentor: Sandra L. Caron

Abstract: The purpose of this qualitative study was to explore beauty pageant contestants' thoughts on feminism. A total of 11 of the 51 state titleholders who had competed in the 2020 Miss USA Competition were interviewed. The objective of the study was to gain an understanding of how women who compete in beauty pageants view their participation in light of feminism. In-depth semi-structured interviews were conducted. The research questions focused on the meaning for participants, pageantry support for feminist ideals, self-identification as a feminist, and response to feminist critics. Each interview was transcribed and coded for major themes. The resulting themes will be presented, along with a discussion of implications and suggestions for future research.

711. How Race, Gender, and Body Positioning Impact Perceptions and Interactions With Those in Power

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Adele Weaver

Mollie Ruben

Faculty Mentor: Mollie Ruben

Abstract: How might the typical white perceiver behave while interviewing with a Black manager who puts her hands on her hips when she speaks? Would they act uncomfortable and anxious, leaning away from her? Would they engage with her and smile more? Lastly, would they react differently if the manager was a white man or a Black man? Even though it is known that Black people in expansive positions are perceived more negatively than white people in expansive positions, there has yet to be an observation of white people's nonverbal behavior in interactions with Black and white individuals in different body positions (Karmali, 2019). White undergraduates from the University of Maine completed a recorded Zoom mock interview with a supposed interviewer (target) whose Zoom photograph differed by race, gender, and body positioning (expansive/restrictive). A female interviewer's voice was pre-recorded and tuned down several decibels for the male condition. Participants' impressions of the interviewer and attitudes toward race via the Modern Racism Scale (McConahay, 1986) were collected, and we coded participant's nonverbal immediacy behavior during the interview. We hypothesized that participants would rate Black targets similarly to white targets on various impressions (i.e. warmth and likeability), however, we posited that less nonverbal immediacy would be displayed with Black compared to white targets (i.e. less eye contact, body squared away), especially when targets were in an expansive position. This research will expand our understanding of how to effectively tailor DEI initiatives that foster positive attitudes toward Black people in power.

712. Intimate Partner Violence Resulting in Homicide: A Content Analysis of Maine Newspaper Coverage of IPV Homicides

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

James Sapiel Sarah Lungarini Olivia Perfito

Faculty Mentor: Sandra L. Caron

Abstract: Many people learn about and form opinions about IPV from the media, such as newspaper articles, evening news reports, and television dramas. Our research team sought to answer the following question: "How do Maine newspapers discuss intimate partner violence resulting in homicide?"

Method: Our content analysis involved newspaper articles on IPV resulting in homicide between the years 2000 to 2020. Articles were obtained from three major Maine newspapers: Bangor Daily News, Portland Press, and the Sun Journal. A total of 80 articles were found using a combination of the search terms "intimate partner violence," "domestic violence," "murder," and "homicide." The 80 articles were read and coded for common topics or themes that appeared in the content of the articles. The research team met to share their individual codes, which were compared, differences discussed, and final coding of themes was determined Findings: Our content analysis revealed that most news reports provide factual coverage of the occurrence: Names, ages, manner of murder, and how law enforcement was notified. Based on the themes emerging from these newspaper articles, information is provided on the background of the relationship, and have a humanizing angle to the victim. We found that only when it was a murder-suicide did the stories of their relationship become a greater focus of the article (as compared to articles involving IPV homicide). Details of their relationship was discussed, and in some cases a photo was included of the victim or couple. Implications will be discussed. **713.** Investigating the Mechanisms Linking Regular Sleep Patterns With Daytime Physical Activity In Older Adults

Submission Type: Virtual Presentation

Submission Category: Social Sciences and Humanities

Author(s):

Angelica Boeve Rebecca MacAulay

Faculty Mentor: Rebecca MacAulay

Abstract: Sleep disturbances and physical inactivity are widespread public health concerns that account for extensive health care costs and premature mortality rates each year. Increasing evidence demonstrates dynamic relationships between sleep and physical activity in older adults, reflective of circadian rhythms, which have the potential to negatively influence health and well-being when they are disrupted. However, prior research has primarily focused on the role physical activity has on sleep health rather than the reverse. The present study aimed to improve understanding of which sleep characteristics as well as how sleep characteristics affect daytime physical activity as people age. Using previously collected data from the Midlife in the United States (MIDUS) study, a structural equation model assessed direct and indirect relationships between actigraphy-assessed sleep characteristics with total physical activity levels in a sample of 261 middle-to-older-aged adults (55+ years old). Analyses revealed that greater consistency in sleep duration across seven days associated with higher levels of total physical activity after accounting for the negative effects of sleep efficiency. These findings suggest that the consistency of sleep duration across each night may be an important clinical recommendation to provide to older individuals, in addition to that of obtaining an optimal amount of sleep duration within each night. These results also call into question the underlying construct of sleep efficiency in this type of research. This knowledge may ultimately help clinicians provide more specific recommendations to clients about sleep behaviors needed to optimize physical activity levels in middle-to-older age.

714. Mediation of the Religion-Prejudice Link

Submission Type: Virtual Presentation

Submission Category: Social Sciences and Humanities

Author(s):

Aaron Dustin Jordan LaBouff

Faculty Mentor: Jordan LaBouff

Abstract: Although religious teachings typically recommend prosocial behavior, religiosity is reliably linked to prejudice. This paradoxical relationship raises the question: what is it about religion that might lead to prejudice despite religion's apparent drive for prosociality? The answer may lie with religious fundamentalism, a particularly rigid way of holding one's religious beliefs as the single deepest and most certain source of truth. We propose that religious fundamentalism mediates the relationship between religiosity and prejudice. We also seek to explore the influence of three facets of inflexible thinking (belief rigidity, dualism, and inviolacy) on the relationship between religious fundamentalism and prejudice.

We're looking specifically at prejudice against Muslims in a Christian sample for several reasons: 1) Christians see Muslims as a value-violating outgroup and previous research has linked Christian religious fundamentalism to anti-Muslim prejudice, 2) prejudice against Muslims in the U.S. is fairly common, and 3) anti-Muslim prejudice in the U.S. is not as stigmatized as many other forms of prejudice, making it easier to measure directly.

To test this mediation, we used an online survey of an all-Christian sample (n=227) collected through UMaine. Participants completed multiple measures of religiosity, prejudice against Muslims, and religious fundamentalism, as well as measures of belief rigidity, dualism, and inviolacy. Mediation analyses show that religiosity is linked to prejudice only through the mechanism of religious fundamentalism, and correlational results show that inviolacy may be a nonreligious component of religious fundamentalism that is linked to prejudice.

715. Now or Later? Decision-Making Preferences in Community-Dwelling Older Adults

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Amy Halpin Savannah Michaud Lauren Moore Rebecca MacAulay

Faculty Mentor: Rebecca MacAulay

Abstract: When deciding between now and later, the tendency to devalue later outcomes is known as temporal discounting. The degree of devaluing is known as one's discounting rate. Steeper temporal discounting rates indicate preferences for immediate gains and delayed losses, reflecting a desire for instant gratification and greater loss aversion, respectfully. Considering that decrements in decision-making abilities may precipitate cognitive dysfunction and decline, a better understanding of decision-making preferences among older adults represents an important endeavor. Thus, the current study aimed to investigate whether differences among temporal discounting rates for gains and losses exist when outcomes are monetary or interpersonal in nature. Sixty-four community-dwelling older adults (75% female, Mage=72) completed a hypothetical discounting task in which they chose between smaller immediate outcomes and larger delayed outcomes presented at various delay periods of one week, one month, six months, and one year. An iterative algorithm determined the indifference point for each delay period. Indifference points were fit to hyperbolic models using nonlinear regressions to determine discounting rates within each condition. Non-parametric Wilcoxon Signed-Rank tests compared discounting rates. Older adults more steeply discounted monetary gains as compared to monetary losses (Z=-4.24, p<.001), as well as for social gains compared to social losses (Z=-2.17, p=.007). They also discounted social gains more steeply than monetary gains (Z=-2.81, p=.001), and social losses more steeply than monetary losses (Z=-3.19, p=.001). These results suggest older adults displayed a greater desire for instant gratification of rewards, particularly social rewards, yet also displayed lower loss aversion, particularly for monetary losses.

716. Sleep Disturbance, Mood State, and Cognitive Performance: The Maine-Syracuse Longitudinal Study

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Samantha Sudol

Michael Robbins

Faculty Mentor: Michael Robbins

Abstract: In this study, relationships among sleep disturbance, positive and negative emotion, and cognitive performance are examined using data from the Maine-Syracuse Longitudinal Study (MSLS) archive. The MSLS is a 35 year study of aging and cardiovascular disease risk factors for lowered cognitive functioning. Cross sectional data are available for up to 1080 participants at Wave 6 of the MSLS, the first wave including two measures of sleep quality, the Sleep Disturbance Scale and Sleep Apnea scale. Indices of symptoms of depression, anxiety, and positive emotion include the Zung Depression Scale, the CES-D Depression Scale, trait anxiety and trait curiosity from the Spielberger State-Trait Personality Inventory, the Cornell Medical Index, and the General Well-Being Adjustment Scale. The cognitive test battery includes a range of neuropsychological tests from versions of the Wechsler Adult Intelligence Scale, Wechsler Memory Scale, and Halstead-Reitan Neuropsychological Test Battery, among others (Elias et al., 2006). Demographic and lifestyle variables are used to characterize the sample and used as covariates. Initial correlation analyses indicate strong associations for 4-item sleep disturbance scale scores with the measures of symptoms of depression (r's greater than .40), trait anxiety (r =.31), and General Well-Being measures of positive emotion (r = -.38), control (r = -.34) and vitality (r = .55) but not with indices of cognitive performance (all p > .05). On the other hand, higher sleep apnea scores were associated with poorer performance across cognitive domains. Analysis of the sleep measures with mood state and cognitive performance continues.

717. Baselines, Shoreline Change and Beach Management Strategies

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Katherine Follansbee Kathleen Bell Caroline Noblet

Faculty Mentor: Kathleen Bell

Abstract: Changing shorelines are impacting human and natural systems globally, changing how people live, work, and recreate in coastal areas. Climate change and increased storm events are intensifying shoreline changes and their effects. In response, coastal resource managers are developing a variety of solutions. Yet, many questions remain about these solutions in Maine and beyond.

My sustainability science research focuses on the management of shoreline change at Maine's Popham Beach State Park. Popham Beach State Park is a popular recreation area for locals and visitors, hosting 162,518 visitors in 2020. Yet, erosion continues to threaten the park's infrastructure and modify the beach. While coastal managers, including Maine's Coastal Program, Geological Survey, and Bureau of Parks & Lands, recognize the importance of understanding public awareness of shoreline change and support for management actions, little is known about either.

My research addresses this information gap and uses survey data collected in 2016 and insights from behavioral economics to assess the relationships between beach users' visitation patterns, awareness of shoreline change, and support for the state taking different actions. Results to date show that years of visitation are positively correlated with awareness of shoreline change, but seemingly uncorrelated with support for management approaches. Respondents were divided as to whether the state should address changing shorelines or let nature take its course, and responses varied greatly when asked which management solutions were highest priority. Our findings offer insights to coastal managers in Maine and beyond as they engage with the public about coastal management solutions.

718. Reconstructing the Romantic Legacy: Annotating the Sublime, Imagination, and Freedom through Black Studies

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Molly Glueck Elizabeth Neiman

Faculty Mentor: Elizabeth Neiman

Abstract: This project advances research begun in a spring 2021 course on British Romanticism as viewed through the lens of 21st century Black Studies scholarship. The Romantic ideals of imaginative freedom and universality of vision sit uneasily with the reality of slavery in the British colonies. My focus is "Black Annotation," a method forged by Christina Sharpe in her search to revise common representations (in media and history) of Black lives. I use this conceptual framework to consider how Romantic ideas about freedom and oppression operated in the late eighteenth-century, and how we understand these ideas today. Within my research, it has become clear that Romanticism's legacy is still largely concerned with key Romantic terms (imagination, reflection, and the sublime) as they are defined by white, male figureheads such as Edmund Burke and William Wordsworth. Despite the number of female authors writing about and re-imagining the meanings of these terms in the same period. With this in mind, I posit that framing readings of Romantic texts (canonical and noncanonical) through the study of authors like Sharpe and Saidiya Hartman opens up these traditionally Romantic terms and helps us reconsider notions of freedom for writers that might otherwise seem "limited" by social status. I also explore my own introduction to Romanticism as an undergraduate student-acknowledging the necessity of integrating contemporary Black authors into Romantic studies.

719. Perceptions of Maine Law Enforcement Agents by Members of the Substance Use Disorder Community

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Aran Wollard

Karyn Sporer

Faculty Mentor: Karyn Sporer

Abstract: The goal of this research is to understand how members of Maine's harm reduction community perceive the effectiveness of criminal justice responses to substance use disorder (SUD). Data from 25 interviews with those in recovery from SUD, politicians, doctors, government officials and other individuals with some relation to SUD in Maine were analyzed using a modified version of grounded theory. The data analysis revealed a generally negative perception of police effectiveness. Participants acknowledged that despite some positive encounters or engagement with local law enforcement, policies in place and general attitude of policing drug use in Maine makes it difficult to have a positive interaction with the police as a person using drugs. This research concludes with recommendations for better addressing substance use disorder and Maine communities more broadly.

720. Envisioning a Bold Food Waste Policy for Maine: A Mixed-methods Study Into the Context of Landfill Diversion of Food Waste

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Dominique DiSpirito

Robert Glover

Faculty Mentor: Robert Glover

Abstract: Landfilled organics waste both natural and financial resources by discarding usable materials that could bolster food security programs and composting efforts. According to the Drawdown Project, one-third of the food we produce in the United States goes to the landfill without ever reaching someone's plate, contributing to leachate at disposal sites and accounting for more greenhouse gasses than the entire airline industry. As communities across the state struggle to support the 1 in 6 Mainers experiencing food insecurity with dwindling financial resources and limited personnel, food waste diversion provides a local solution that bolsters resilience at low cost. The absence of bold food waste diversion policy in Maine is not due to a lack of successful examples nearby, as Vermont's recent universal organics recycling policy has seen tremendous success both in diverting more than 53,000 tons of food waste per year and in yielding a 40% increase in food donations. However, Maine faces distinct logistical challenges that complicate efforts to scale up current local food waste diversion efforts such as regional population sparsity and staffing resource constraints. This thesis project examines how Vermont's Universal Recycling Policy could inspire a path forward to a food waste diversion policy that would work for Maine. The analysis draws upon professional interviews, surveys sent to municipalities, and organizational reports to examine the barriers and assets at play in Maine's journey toward a bold food waste diversion policy, culminating in suggestions that will work for Mainers.

721. Scoping Review: Burnout and Its Implications for Community Health Workers

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Emma Williams Tyler Capone-Zeman Dubois Jennifer Crittenden

Faculty Mentor: Jennifer Crittenden

Abstract: This presentation will serve as a scoping review of burnout within the helping professions in America. Burnout is something that is faced by everyone in this country, but especially within the helping professions. Helping professions would include but are not limited to, healthcare workers, patient navigators, community health workers, social workers, community volunteers, and clinicians. Burnout can be defined, loosely, as the overworking of an individual to the point of exhaustion within that individual. Burnout can be exasperated by conditions both external and internal to the workplace such as high workloads, low pay, and the COVID-19 pandemic. Burnout can also be affected by personal challenges such as mental illness, relationship strife, and lack of time for self-care. This scoping review, conducted by undergraduate research fellows, is part of a larger project examining systemic barriers that Maine community health workers (CHWs) face when assisting communities. Taking part in this research process illuminated the literature regarding what burnout is and possible solutions for burnout and how those concepts apply to CHWs. This presentation will examine and present the various literature surrounding burnout. Burnout is a complex situation that can be slowed and stopped when the correct measures are implemented within the workplace. This presentation will discuss how the traditional 9-5, five-day work week can affect burnout. Scoping review findings were used to develop interview questions for the larger CHW project and community education materials.

722. Evaluation of a Resource and Service Navigation Program on Family Resources and Kinship Caregiver Wellbeing

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Jennifer Jain Jennifer Crittenden Travis Bryant David Wihry

Faculty Mentor: David Wihry

Abstract: In Maine, approximately 16,500 children are informally raised by family members other than their parents (kinship families) and there is a growing need to identify and improve support and services. The Kinship Navigator program through Adoptive and Foster Families of Maine connects kinship families to resources, such as legal services, public assistance, and support groups. The aim of this study was to evaluate the effectiveness of the Navigator program. The University of Maine Center on Aging surveyed enrolled kinship families (N=22), at baseline and 90 days after their intake into the Kinship Navigator program. The main outcome of the study was family access to resources as measured by a modified twenty-three item version of the Family Resource Scale utilizing a 5 point likert scale. Paired Samples T-Tests compared scores on the Family Resource Scale at 90 days post-intake. Statistically significant differences in mean resource needs were found on nine items, indicating improvements in family resources with regard to home heating (mean increase of .83, t(11) = -2.8, p<.05), adequate clothing (mean increase of 1.17, t(11) = -3.39, p<.00), opportunities for rest (mean increase of 1.0, t(11) = -2.71, p<.05), and family medical care (mean increase of 1.08, t(11) = -3.03, p<.05). Furthermore, data will be presented on participant satisfaction with the program and changes in caregiver well-being. Limitations include small sample size and lack of comparison group. Implications for service provision to kinship caregivers will be discussed.

723. Life in Recovery in Maine: Recovery Outcomes & Policy Attitudes About Solutions to Addiction in Maine

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Michael Delorge Bonnie Snyder Jacob Chaplin Bryce Andrews Sam Ransley Robert Glover

Faculty Mentor: Robert Glover

Abstract: In 2021 alone, Maine saw a 30% annual increase in the number of overdose deaths (636) due to prescription and illicit drugs. This alarming trend raises significant questions about the appropriate policy response to quell the growing crisis that many experts consider an epidemic. However, individuals afflicted with substance use disorder (SUD) and those in active substance use recovery are often overlooked in the policy process. To fill the gaps in existing research, this study asks what recovery outcomes and experiences look like in Maine. Further, it evaluates public attitudes towards policy solutions to the Maine addiction crisis and gives a voice to the underrepresented community of recovery. What are the impacts of addiction and recovery experiences on an individual's life? How do addiction and recovery experiences shape attitudes on substance use policy? This study's 75-question survey has been designed through the Qualtrics platform and distributed through a partnership with the Maine Recovery Advocacy Project (ME-RAP) to recovery centers and stakeholder advocacy organizations around the state. The results will both inform Maine substance use policy while providing data-rich policy insights for those attempting to understand the life experiences of those in active addiction and recovery nationally.

724. Local Energy Action Network

Submission Type: Virtual Presentation

Submission Category: Social Sciences and Humanities

Author(s):

Wendy Crosier Sharon Klein

Faculty Mentor: Sharon Klein

Abstract: A recent study for the Senator George J. Mitchell Center for Sustainability Solutions revealed a strong need for a community energy learning network in Maine that could expand through the Northeast. Such a network would provide a platform for communities in Maine and beyond to connect with and learn from each other about community energy action that involves deployment of new renewable energy installations (with an initial focus on solar energy) and energy efficiency. It would also streamline communications about and build capacity to respond to funding and technical assistance program announcements from federal government agencies. With support from a CUGR research grant I have been working with Dr. Sharon Klein, Associate Professor of Economics at UMaine, to develop capacity for this type of network, including assembling key stakeholders and developing a grant application. My presentation to the UM Student Symposium will provide an overview of the prior work leading up to this project, discuss similar networks operating in neighboring states and how Maine can learn from them, and provide an update on our efforts to secure funding to create such a network in Maine. By leveraging federal and state funds, we hope to make the Local Energy Action Network (LEAN) a reality for Maine, with a vision to scale-up to a regional, and maybe even national effort in the future.

725. An Assessment of Visitor Use and User Experiences with the Implementation of a Cadillac Mountain Reservation System in Acadia National Park

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Rebecca Stanley

John Daigle

Faculty Mentor: John Daigle

Abstract: Acadia National Park (ANP), located in coastal Maine, experiences high visitation during the busy summer months and is one of the top ten visited parks in the United States. To address the issues of overcrowding, a timed-entry reservation system has been implemented for Cadillac Mountain (CM) May to October 2021. The current increase in automobile use on CM has created safety concerns and influences visitor satisfaction. Visitors were asked when they first learned about the reservation system, nearly half (47%) reported learning 1 - 3 months ahead of their trip. Over half (58%) of respondents indicated they purchased within 48 hours of entering CM. Approximately 90% of visitors, regardless of income levels, are willing to pay at least \$10 for their CM reservation. This is roughly two times the cost of the current permit of \$6. There was no significant difference between first-time and repeat visitors' willingness to pay. In an Importance Performance Analysis review, levels remained high on critical attributes such as a sense of safety, freedom to explore, and the amount of traffic on CM summit road. Overall, Adaptive management and consistent monitoring are needed to address current visitor transportation management techniques and maintenance of a high-quality visitor experience.

726. Confrontation Effectiveness Influences Women's Imagined Psychological Wellbeing After Sexism

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Shelby Helwig Shannon McCoy

Faculty Mentor: Shannon McCoy

Abstract: Confronting sexism may benefit women's psychological wellbeing in the short- or long-term after a sexist event. Preliminary evidence suggests that confrontation effectiveness, or changing a sexist perpetrator's attitudes or behaviors, influences women's satisfaction and positive emotion after confronting sexism. The current experiment expanded this work and investigated if engaging in an effective versus ineffective confrontation influenced if confrontation is beneficial for psychological wellbeing. Women (N = 359) anticipated their response to blatant sexism (83.3% anticipated confronting). After responding, women were assigned to 1 of 4 conditions that manipulated change in the sexist perpetrator's attitudes or behaviors. Results suggested confronters consistently anticipated increases in wellbeing [self-esteem: F(1,293) = 15.10, p < .001, $\eta p 2 = .05$; empowerment: F(1,294) = 48.90, p < .001, $\eta p 2 = .14$; perceived control: F(1,294) = 3.48, p = .063, $\eta p 2 = .01$] when confrontation effectively changed the sexist decision, but not necessarily sexist attitudes. Implications for the use of interpersonal confrontation as a coping strategy after sexism and an in progress, follow up experiment investigating in-person responses in the same experimental paradigm will be discussed.

727. Challenging Transformation: Taking Theory to Practice in Carceral Education

Submission Type: Exhibit

Submission Category: Social Sciences and Humanities

Author(s):

Colleen Coffey Kathleen E. Gillon

Faculty Mentor: Kathleen E. Gillon

Abstract: The purpose of this scholarly paper is to use the theoretical frameworks of Foucault (1977) and Freire (1970), in an effort to examine how paradigms of punishment and fear can be transformed to liberation through healing narrative. I argue that we must recognize the key ingredients of fear and discipline needed to deprive power also simultaneously deprive people of freedom worse than incarceration. What is stolen is dignity. To achieve truly transformative experiences while operating in spaces of fear, educators must empower students to be free under duress. Educators who occupy carceral spaces deeply rooted in punishment must recognize the existence of a constant juxtaposition: to educate another is to recognize their humanity, but to incarcerate another is to deny that same humanity. In order for prison education to be truly transformative, we must address the "power over" paradox and push for true reform in the carceral setting. Using genealogy and narrative, we can come to understand the contrary critical frames that we ask our students to use in the very spaces where they get punished for using them. Using critical power to truly liberate our students is to help them understand the power of their own narratives are the EXACT tools needed to dismantle the master's house.

Foucault, M. (1977). Discipline and punish: The birth of the prison. London: Allen Lane.

Freire, P. (2005). Pedagogy of the Oppressed: 30th Anniversary Edition. The Continuum International Publishing Group Inc.
728. Resiliency in the Face of Cyber Victimization: Family, but not Peer, Support Emerges as a Protective Factor

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Eleanor Schuttenberg Caroline Kelberman Michelle Buffie Tayah Mower Carmen Irujo Douglas Nangle

Faculty Mentor: Douglas Nangle

Abstract: Cyber victimization (CV), or exposure to behaviors that are perpetrated online or via technology, is prevalent among adolescents (Zhu et al., 2021). Such exposure has been linked to increased depression (Tran et al., 2021). Perceived social support (PSS) is one mechanism demonstrated to be protective against depression across the lifespan (Gariépy et al., 2016). The present study investigated the influences of three major types of PSS (friends, significant others, and family) on the CV-depression relationship. Adolescents (N = 119) aged 13-17 completed the Center for Epidemiological Studies Depression Scale, the Cyber Peer Experiences Questionnaire-Adolescent, and the Multidimensional Scale of Perceived Social Support. Lifetime CV was positively correlated with depression symptoms (p < .001). Depression was negatively correlated with all three subscales of PSS (friends, significant others, and family p < .05). However, CV was significantly negatively correlated with only PSS of family (p < .001). A mediation analysis was performed using PROCESS: the full model accounted for 27.52% of the variance (R2 = .2752, F(2, 116) = 22.03, p < .001). More lifetime CV predicted lower levels of PSS of family and more depression, while lower levels of PSS of family predicted more depression. PSS of family had a significant indirect effect on the relationship between lifetime CV and depression (b=2.44, CI .98, 4.08). PSS of families provides one possible pathway that

CV may lead to depression in adolescents. Therefore, PSS from families appears to function as a protective factor for victimized adolescents.

729. Objectifying the Classroom: An Examination of Self-objectification, Appearance Comparisons, and Their Effects on Cognitive Resources Within Video-class Environments

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Leah Savage Amelia Couture-Bue

Faculty Mentor: Amelia Couture-Bue

Abstract: In light of restrictions in face-to-face interactions from the COVID-19 pandemic, Zoom, a video conferencing platform, has profoundly altered means of educational and professional communication through virtual meetings. While Zoom mimics in-person interaction, it also mirrors many of the unique affordances of highly visual social media use, such as the representation of oneself as an image on a screen and the ability to view and objectify ourselves and others. The current research examines how educational settings taking place on Zoom might be impactful on the mental processes of female students. Specifically, we asked whether certain camera setting on Zoom could enable state self-objectification, and thus deplete cognitive resources and performance within these virtual environments. A three condition, between-subjects design was used to measure female college students' self-objectification, appearance comparisons, appearance satisfaction and cognitive performance. Female students (n = 191) were recruited using targeted ads on Instagram and from the University of Maine SONA participant pool. Participants completed a pre-test survey before participating in a class-like Zoom call either A) with their camera on and with self-view, B) with their camera on but without self-view or C) with their camera off. Preliminary results indicate that participants who were instructed to participate with their camera on but without self-view (i.e., condition B) performed significantly worse on the math test than those in the other conditions, while there was no difference in cognitive performance between the other conditions. Though results trended in the expected direction, self-objectification did not differ based on condition.

730. Clarifying the ADHD and Depression Relationship in Emerging Adults: Specific Dimensions of Emotion Regulation Difficulties as Mediators

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Caroline Kelberman Eleanor M. Schuttenberg Michelle L. Buffie Carmen Irujo Tayah Mower Douglas W. Nangle

Faculty Mentor: Douglas W. Nangle

Abstract: ADHD and depression are closely linked disorders. Researchers have identified emotion regulation (ER) as a mechanism that underlies the relationship. The present study explored the mediational role of five well-established ER dimensions as potential mediators on the relationship between ADHD and depressive symptoms in emerging adults. Undergraduate students (N = 362) aged 18-24 completed the Difficulties in Emotion Regulation Scale (DERS), Adult ADHD Self-Report Scale Symptom Checklist (ASRS), and Center for Epidemiologic Studies Depression Scale (CESD). The tested ER dimensions were derived from the DERS: nonacceptance of emotional responses, difficulty engaging in goal-directed behavior, impulse control difficulty, limited access to emotion regulation strategies, and lack of emotional clarity. All correlations were in the expected directions and significant (p's < .001) and the overall pattern did not differ for males and females. Five mediation models were tested using PROCESS and controlling for gender. Two of the mediation models emerged as significant. Limited access to ER strategies and ADHD symptoms accounted for 45.29% of the variance in depressive symptoms (R2 = .4529, F(3, 358) = 50.42, p < .001) and difficulty engaging in goal-directed behavior and ADHD symptoms accounted for 34.31% of the variance in depressive symptoms (R2 = .3431, F(3, 358) = 62.34, p < .001). The indirect effects of both subscales were found to be statistically significant (95%CI.16, .39 and 95%CI.17, .35 respectively). Targeting limited

access to ER strategies and difficulty engaging in goal-directed behavior may be particularly useful in interventions for individuals with comorbid ADHD and depression.

731. Universals and Their Relation to the Limits of Human Understanding

Submission Type: Virtual Presentation

Submission Category: Social Sciences and Humanities

Author(s):

Samuel Vaccaro Robby Finley

Faculty Mentor: Robby Finley

Abstract: Philosophers and mathematicians have long been interested in identifying and characterizing the fundamental, universal concepts that form the basis of how we think about the world. These concepts constitute what some philosophers have called "conceptual schemes", which are ways of organizing our experience into systematic categories that give structure to our sensory data. In this talk, I argue that the mathematical tool of Category Theory provides a characterization of conceptual schemes that depicts fundamental aspects of our ability to understand universal concepts. Further, using this framework reveals that there are aspects of these frameworks that cannot be conceptualized in a way that preserves all the explicit information. Any choice of conceptual scheme alienates some objects from their true natures by assigning them to some category and reveals the limitations of our ability to express and organize the world around us. I then apply these findings, arguing that these themes have been echoed throughout history in Buddhist and Daoist thought alluding to the fact that there is no inherent nature or universal that can capture all quantitative or conceptual qualities. From this we see a clear limit to our ability to conceptualize our experiences in a way that maintains the full expressiveness needed to capture the true nature of the world.

732. The Relationship Between Tabletop Roleplaying Games, Depression, and Anxiety

Submission Type: Virtual Presentation

Submission Category: Social Sciences and Humanities

Author(s):

Noelle Ott Jordan LaBouff

Faculty Mentor: Jordan LaBouff

Abstract: Tabletop roleplaying games are a form of in-person multiplayer gaming structured around group interaction, set rules of gameplay, strategic group decision-making, and active character roleplaying. While such games have existed in some form for thousands of years, more recent and modern versions such as Dungeons & Dragons and Call of Cthulhu have increased attention not only to its use as a form of entertainment, but as a potential extension of play and drama therapies in a clinical setting (Henrich & Worthington, 2021). Research on the use of therapeutic roleplaying with and without supervision of gameplay have come to be associated with increased understanding of self-concept and connection to community (Winn, 1959; House 1970), as well as a reduction in depression and anxiety (Burroughs, Wagner & Johnson, 1997; Wilde, 1994). However, much of previous investigation has remained in younger age groups, where play and drama therapies are more often applied, and has focused on individual development and social connections. Only recently have studies begun to study tabletop roleplaying games as a form of therapy and most have involved case studies that apply theoretical and anecdotal, rather than clinical, evidence of the game's effective use as a mechanism of therapeutic treatment (Blackmon, 1994; Hughes, 1988). The current study aimed to extend tabletop roleplaying games research to a larger, more varied age group (N = 184, Average age = 19.2) through an online survey, assessing their experience with the game and reasons to participate in gameplay as well as any correlations between levels of depression, anxiety, and amount of participation in tabletop roleplaying games. Results indicated that participants generally felt that tabletop roleplaying games supported their mental health and well being, particularly in the context of roleplaying in their character's mindset. We also found that frequency of play was associated positively with symptoms of depression and anxiety, even when controlling for predictors on the Ten Item Personality Measure such as conscientiousness and emotional stability (Gosling et al., 2003). This may suggest that individuals experiencing

depression or anxiety may turn to tabletop roleplaying games as a way to respond and cope with these symptoms. The implications of these results, as well as directions for further research in this burgeoning field are discussed.

733. Efficacy of Various Trainings to Increase the Accurate Perception of Fatigue

Submission Type: Virtual Presentation

Submission Category: Social Sciences and Humanities

Author(s):

Morgan Stosic Mollie Ruben

Faculty Mentor: Mollie Ruben

Abstract: There is a critical need to be able to detect fatigue in others as fatigue can impact individuals on the job (e.g., by impairing speed/accuracy and decision-making/memory) and because fatigue is generally unpleasant for those experiencing it. However, recent research has shown that individuals are generally inaccurate (i.e., worse than guessing/chance) when it comes to identifying fatigue in others, suggesting a pressing need for trainings and interventions. The current research aims to address this practical problem by testing the efficacy of various training techniques in order to increase fatigue detection accuracy. Specifically, we will test two previously established emotion perception training techniques, applied, for the first time, to the domain of fatigue. The first of these trainings will employ practice and feedback, which will allow perceivers (i.e., those doing the judging) to view various targets (i.e., individuals being judged) experiencing differing levels of fatigue, and receive feedback regarding whether their judgments were correct or incorrect. We will also test an education-based intervention that teaches perceivers which nonverbal cues to pay attention to in order to make accurate fatigue judgments, and which nonverbal cues to ignore. Testing the efficacy of these two training paradigms will allow us to answer the question of whether humans can be trained to become better perceivers of others' fatigue, and how we can go about achieving this objective in order to limit the effects of fatigue on costs, performance, and health. Result and implications are discussed.

734. The Challenges of Operationalizing Confrontation of Prejudice: Testing Three Measurements of Confrontation in Three Multimethod Experiments

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Ailin Liebler-Bendix Shelby Helwig Shannon McCoy

Faculty Mentor: Shannon McCoy

Abstract: Researchers investigating confrontations of prejudice often use coding systems to classify responses to prejudice. We similarly investigated women's responses to blatant sexism but employed three operationalizations of confrontation: (1) a categorical coding system, (2) a self-report measure, and (3) an experimental manipulation. In the first, online study, we categorized most women (83%; n = 296) as confronting sexism. Consistent with our categorical system, confronters reported significantly higher intentions to confront (M = 5.48, SD = 1.43; U = 6817.00, z = -2.88, p = .004) compared to non-confronters (M = 4.77, SD = 1.76). In a second, in-person study, we categorized almost half of women as confronters (43.3%). Confronters (M = 5.55, SD = 1.96) reported significantly greater intention to confront compared to non-confronters (M = 3.31, SD = 2.31; t(55) = 4.08, p < .001, d = 1.08). In a third study, we successfully tested a novel manipulation of women's (N = 31) confrontation behavior through an instructional set. Women in the confrontation condition called out sexism after experiencing sexism while women in the no confrontation condition did not call out the sexism. These results suggest that categorical coding systems capture relative differences in perceived intention to confront during an imagined confrontation but more accurately reflected intention to confront during an in-person experiment. Our results suggest different operationalizations of confrontation behavior, in the form of self-reported intentions and experimental manipulations, may strengthen insights learned within this field depending on the experimental methodology employed.

735. Healthier Than Their Peers? COVID-19 Outcomes in Recreation Counties

Submission Type: Virtual Presentation

Submission Category: Social Sciences and Humanities

Author(s):

Peter O'Brien Kathleen Bell

Faculty Mentor: Kathleen Bell

Abstract: Improved understanding of geographic variation in COVID-19 health outcomes strengthens public policy and related management responses. Public lands, parks, and conservation areas played a key role in supporting some communities throughout the pandemic. Yet, many questions remain about the experiences and health outcomes of recreation counties. While recreation areas provide open spaces to remain socially distant from others, they also attract visitors and involve industries that depend on interactions with the public. Land, natural resource, and tourism development managers are interested in the extent to which health outcomes varied in recreation-dependent economic regions versus others. In this research, we compared COVID-19 health outcomes for US recreation and non-recreation counties using visual, descriptive, and regression analyses. We created a novel dataset summarizing outcomes in the 3,061 counties of the US by integrating data describing COVID-19 health outcomes, demographic characteristics, and regional economic characteristics. We focused on the 20-month period between January 2020 and August 2021 to examine differences in trends across county types. Overall, we found similar trends over time in COVID-19 monthly infection rates in recreation and non-recreation counties but detected some differences between recreation and non-recreation counties depending on their metro or non-metro status. Lower case outcomes in recreation counties are driven nationally by lower cases in non-metro recreation counties. Deaths in recreation counties are lower than in non-recreation counties in both metro and non-metro areas on a per capita basis. Our exploratory research is informing regional and national discussions about the linkages between recreation and health & well-being.

736. Adolescent and Friends' Empathetic Distress and Internalizing Symptoms Longitudinally: Can Empathy be Harmful?

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Raegan Harrington Rebecca Schwartz-Mette

Faculty Mentor: Rebecca Schwartz-Mette

Abstract: Adolescence is a developmental period distinguished by both an increased risk for developing internalizing symptoms (Ghandour et al., 2019) and continued refinement of empathy skills developed in childhood (Allemand et al., 2015). Empathy, (i.e., ability to understand and feel what others are feeling; Davis, 1980), is typically regarded as a prosocial/protective construct. More recently, however, research has begun to argue it is not always adaptive (Bloom, 2017). Empathetic distress (i.e., experiencing a relationship partner's distress and problems as one's own distress and problems; Smith & Rose, 2011) is one example of potentially costly empathic abilities, with one study documenting higher levels linking to increased anxiety symptoms (Smith, 2015). Could empathy be harmful? And what does it do to our friends? The current study replicates and extends past work by testing links of empathetic distress with anxiety and depressive symptoms in close adolescent friendships. Adolescents (N = 186) in same-gender, best friend pairs reported their anxiety and depressive symptoms and empathetic distress at three intervals over six months. Low empathetic distress in adolescents (but high empathetic distress in friends) predicted increases in adolescents' depressive symptoms over the first 3 months. Adolescents' depressive symptoms at 3 months were then linked with increased empathetic distress in themselves, but decreased empathetic distress in their friends at 6 months. Additionally, adolescents' higher initial anxiety symptoms and lower depressive symptoms predicted increased empathetic distress after 3 months. Implications of results and future directions are discussed.

737. Mitigation or Obstruction: Investigating the Use of Development Aid in Mitigating Climate Change and Addressing Climate Migration.

Submission Type: Virtual Presentation

Submission Category: Social Sciences and Humanities

Author(s):

Katie Davis

Faculty Mentor:

Nicholas Micinski

Abstract: As the effects of climate change become more severe and a new US administration tackles migration, an investigation is needed into the use of development aid and how it tackles climate displacement. This project answers questions about where development aid is used, and whether the action that is taken using the grants is productive in addressing the root causes of climate migration. I have examined grants given by the United States to countries in Latin America, and the current US administration's strategy on migration. This was done through qualitative analysis of OECD grants, policy documents, and additional sources. The culmination of the collected research is a case study on a specific grant and what contributions it brings to the discussion surrounding migration. My research will contribute to Professor Micinski's research agenda related to similar issues.

738. Credit Claiming in the Modern Age: Media Influence on Counterterrorism Operation

Submission Type: Poster

Submission Category: Social Sciences and Humanities

Author(s):

Laura Curioli

Asif Nawaz

Faculty Mentor: Asif Nawaz

Abstract: Extant terrorism scholarship argues that terrorists seek media coverage for their attacks to communicate with supporters, the public, governments, and adversaries (Baggozzi and Koren 2017; Whiteside 2020). However, in 1970 the ratio of claimed attacks has reduced from 60% to 14% in the last 50 years (Hoffman 1997; Kearns, Conlon, and Young 2014). Similarly, according to Global Terrorism Database more than 80 percent of terrorist attacks remained unclaimed between 1970 and 2019 (START 2019). If media coverage is essential, then given the level of unclaimed attacks the science and logic behind credit claiming is confounding. What motivates certain groups to claim while others do not? This study aims to examine the relationship between counterterrorism efforts of the government, a groups' propensity of claiming credit, and the ideologies of those groups. In essence we argue that groups' inclination to claim attacks is significantly reduced due to harsh government counterterrorism operations and personal choice based on ideology.

Natural Sciences

801. The Effects of Timber Harvesting on Small Mammal Abundance and Foraging Behavior with Implications for Tick Densities

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Stephanie Hurd Jessica Leahy Laura Kenefic Allison Gardner

Faculty Mentor: Allison Gardner

Abstract: Timber harvesting is a property-scale forest management practice that involves the cutting and removal of trees. Our previous work has shown that forest structural characteristics that result from timber harvesting can reduce densities of nymphal blacklegged ticks, Ixodes scapularis, the vector of the Lyme disease bacterium, Borrelia burgdorferi. One potential mechanism driving this relationship may depend on the small mammals (e.g., white-footed mouse, Peromyscus leucopus; eastern chipmunk, Tamias striatus, etc.) that serve as hosts for the blacklegged tick and B. burgdorferi. Timber harvesting modifies wildlife habitat through changes in overstory cover and understory vegetation. This change potentially alters the abundance or behavior of these small mammals directly, or indirectly by changing predator activity and the resulting threat, or perceived threat, of predation. Altered small mammal foraging and/or abundance could affect tick-host encounter rates, thereby affecting small mammals' tick burdens and, consequently, tick densities in the environment. No study has examined the mechanistic links among forest stand attributes that result from timber harvesting histories, small mammal behavior and population sizes, and blacklegged tick densities. This study uses a combination of techniques (i.e., live trapping, track plates, and foraging trays) that capture different aspects of small mammal population dynamics and behavior to (1) assess small

mammal foraging and population sizes in forest stands with varied structural attributes; and (2) to compare the efficacy and correlation between these different sampling techniques to determine their ability to predict tick burdens.

802. A Novel Study on Sea Lice (*Lepeophtheirus salmonis*) Settlement Success During Atlantic Salmon (*Salmo salar*) Encounters

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Eleanor Glahn

Ian Bricknell

Faculty Mentor: Ian Bricknell

Abstract: It is hypothesized that current velocity influences the settlement success of sea lice (*Lepeophtheirus salmonis*) on its preferred host, Atlantic salmon (*Salmo salar*), however this has not been demonstrated experimentally. The aims of this study were to determine the settlement success of sea lice in current speeds that are frequently encountered in net-pens. Gravid females were collected from naturally infected farmed fish from commercial salmon farms in Cobscook Bay Maine, USA. Egg strings were removed from females, hatched in vitro, and raised to the copepodid stage. Forty-three Atlantic salmon, mean weight 415g. were challenged with 100 copepodids per fish in 14 replicate experiments at a current velocity of 206 mm/sec-1. Lice were counted when they had reached the chalimus stage approximately 7 days later. A settlement success rate of 0.28% (13 chalimus were found from the 4650 copepodids used), with a mean abundance of 0.30 lice/fish and mean intensity of 1.08 lice/fish. The data collected in this study will have significant implications for future research, including sea lice models of louse distribution and risk for industry, and the development of risk mitigation strategies for restoration of wild Atlantic salmon populations.

803. The Effect of Microtopography, Soil Moisture, and Canopy Openness on Survival of Northern White-cedar Regeneration

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Carolyn Ziegra Laura Kenefic Jay Wason

Faculty Mentor: Jay Wason

Abstract: Northern white-cedar (*Thuja occidentalis L.*) is among the least studied commercially important tree species in North America. Northern white-cedar experiences recruitment challenges in portions of its range. The goal of this study is to improve our understanding of the factors that influence the survival of northern white-cedar seedlings by assessing soil moisture, microtopographic position, canopy openness, and mortality throughout the growing season. 144 seedlings were planted across three sites in eastern Maine in partially harvested stands and unharvested control stands. Data was collected for each seedling during the 2021 growing season. Results of the study indicate that seedling survival is dependent upon higher levels of canopy openness and lower soil moisture. This data reinforce our understanding of the importance of mounds for cedar seedlings, as it suggests that mounds improve seedling survival by avoiding excess moisture in these seasonally flooded habitats. Management of lowland cedar stands to improve regeneration outcomes by opening the forest canopy should ensure preservation of microtopography for seedling survival.

804. Completing a Ground-Penetrating Radar Survey of a Subglacial Lake on the Juneau Icefield in Southeast Alaska to select an Analog Polar Study Site for Future Europa Missions

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Jordan Farnsworth Seth Campbell Emma Erwin Devon Dunmire

Faculty Mentor: Seth Campbell

Abstract: Water is crucial to the survival of life. Under this assumption, the presence of water could go hand-in hand with the presence of life elsewhere in our solar system or the universe. Some of the planetary bodies that currently harbor water or ice include Earth, Mars, and Europa, making them subjects of interest. To provide a stepping-stone for a proposed NASA mission to drill through ice and collect a water sample from Europa, NASA Jet Propulsion Laboratory (JPL) is proposing a drill test be completed on Taku Glacier of the Juneau Icefield, Alaska over an existing subglacial lake. Our goal was to provide details on a potential testing site for NASA JPL to test their drilling equipment in a place that serves as an analogue to Europa's supra, englacial, and subglacial terrain. We completed this effort during the summer of 2021 as part of this team project. The fieldwork included a ground-penetrating radar derived ice thickness survey in North Basin on the Juneau Icefield.

805. Measuring Firn Thickness and Volume Change Using GPR Profiles Across the Juneau Icefield

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Emily Holt Mikaila Mannello Seth Campbell

Faculty Mentor: Seth Campbell

Abstract: With over 60,000 glaciers in total, Alaska is a major contributor to the cryospheric system and global sea level rise, an effect which has become even more apparent as the region's glaciers continue to lose ice mass (Zemp et al., 2019). This flux of glacier meltwater has a significant impact on surrounding ecosystems including the Gulf of Alaska, which represents one of the most important marine ecosystems and fisheries from an economic perspective both within the U.S. and globally (O'Neel et al., 2015). In the southeast region of Alaska, the Juneau Icefield (JIF) represents the longest studied glacier system in North America and the second longest studied system on the planet. This long-term record has revealed the advance of its largest ice mass, Taku Glacier, for the past 60 years. However, the Taku recently entered a retreat stage between 2016-2018, which includes surface lowering of 10 m between 2013-2018 (McNeil et al., 2020). Since Taku Glacier represents an index glacier used as an analog to the 60,000 other Alaska glaciers, understanding the cause of glacier surface lowering is critical for the broader understanding of other glaciated regions across Alaska. The current assumption is that surface lowering has been dominated by surface melt and associated firn thinning. As an intermediate stage from the metamorphism of snow to ice, firn represents a less dense and relatively thin but important region of most glaciers because of its ability to store or slow the rate of meltwater transfer from the surface to downstream ecosystems. The firn unit is heavily affected by factors such as surface melt, changes in accumulation and ablation rates, and warming effects. When firm thickness decreases, surface meltwater will form supraglacial streams that flow directly off the non-porous glacier ice surface, altering meltwater flux that is critical to the environment surrounding and downstream of the glacier system. However, this has not yet been confirmed by observations. We hypothesized that a major contributor to surface lowering was caused by firn

thinning, which is in turn related to increased ice velocities or surface melt. Our proposal to confirm the cause of this surface lowering will be useful in developing reasonable estimates of regional firn thickness as well as thinning rates of firn over the past decade. In order to achieve this, spatial and temporal data on firn thickness across the JIF was collected and analyzed using ground-penetrating radar (GPR) and compared to previous repeat datasets from 2012. The results of this project suggest a major impact on downstream ecosystems that rely on a steady meltwater flux, but are instead receiving damaging pulses of meltwater during associated melt events.

806. Comparing Two Non-invasive Methods for Assessing Marine Mammal Genetic Diversity: Environmental DNA vs Fecal DNA

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Sydney Jackson Julia Sunnarborg Christy Hudak Lisa Sette Kristina Cammen

Faculty Mentor: Kristina Cammen

Abstract: As technology and science progresses, the methodology behind observing, monitoring, and sampling marine mammals advances as well. One such technique is environmental DNA or eDNA, which entails extracting organismal DNA from water samples without ever handling or disturbing the organism. It is a cost-efficient and non-invasive method that can be utilized in the sampling of seal haulout sites as is its purpose for this research. Another method, using the DNA analysis of seal fecal samples, is a less invasive method that can also be utilized to monitor and assess marine mammals. Through collecting both fecal and water samples from gray seal haulout sites in Cape Cod, Massachusetts, these two differing, but equally progressive methods can be compared to one another. The water samples collected from the seal haulout sites will be paired for DNA analysis with the fecal samples collected from the beaches where gray seals are hauled out in Cape Cod. DNA will then be extracted from both the water samples and fecal samples, followed by sequencing a portion of the gray seal mitochondrial control region in all the samples. This will allow for the comparison of the haplotypes detected in fecal samples to those detected in water samples as a comparison of these two non-invasive approaches for assessing marine mammal genetic diversity. This comparison aims to uphold the integrity of the eDNA process, as well as investigate and confirm how efficient both processes are in terms of non-invasiveness and assessing marine mammal genetic diversity.

807. Interactive Effects of Climate Warming and Soil Amendments (Biochar-compost and Mulch) on Wild Blueberries and Soil Water Availability

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Sam Roberts Rafa Tasnim Yongjiang Zhang

Faculty Mentor: Yongjiang Zhang

Abstract:

Wild lowbush blueberries are one of the most important commercial crops in Maine. Temperatures in Maine are rising, which could reduce soil moisture due to increased evaporation, and thus reduce water availability to lowbush blueberries. To mitigate such effects of rising temperatures we tested two soil amendments: Softwood mulch, and Biochar-compost mix, in warming chambers (3-5° C higher) at two different wild blueberry fields. Our results indicated that the physiological performance and growth of wild blueberry plants improved under warmer temperatures. We also found that wild blueberry plants growing on the biochar-compost amended soil performed better compared to the plants growing on untreated soil, regardless of the environmental conditions of this experiment. Biochar-compost mix application retained more moisture in the soil, leading to better physiological performance and growth such as higher photosynthetic rates, higher number of leaves and taller stem heights. Softwood mulch treatments retained less moisture than biochar-compost treatments, but had taller stems and more leaves, and retained more leaves later into the fall than other treatments. Soil moisture retaining amendments like biochar could reduce the need for extensive irrigation, helping wild blueberry growers under warmer temperatures and frequent droughts in Maine. **808.** Leaving the Coast Behind: Housing Accessibility and Exurban Development as Measures of Socioeconomic Change and Vulnerability in Maine's Lobster Fishery Communities

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Margaret Campbell

Theresa Burnham

Faculty Mentor: Theresa Burnham

Abstract: In 2021, the Maine lobster fishery recorded its highest ever value, nearly \$725 million. This value may indicate a healthy biological stock and high market price, but it does not represent the increasing challenges the fishery is facing. For instance, exurban migration and coastal community development are displacing sectors such as the seafood industry. The absence of quantitative indicators to monitor these phenomena is an impediment to accounting for them in fisheries science and decision-making. We use the American lobster fishery in Maine, USA, as a case study to introduce two indicators of fishing community change and vulnerability: (1) Housing Access and (2) Exurban Development. Access data includes prices and inventory of real estate in coastal Maine; exurban development data are the addresses of property tax documents that show where owners live. These indicators were identified through 38 interviews conducted along the coast of Maine for factors of importance affecting the fishery. The housing market is an indicator of vulnerability, showing the outmigration of locals and an inward migration of out-of-staters, which is impacting working communities across the country. Our goal is to measure the impact of human population changes on the fishery using the Maine housing market. As housing prices and out-of-staters increase, there are implications for the daily costs of participating in industry, but also for how harvesters can participate in governance processes at local-levels, where decisions about working waterfront access and coastal development are made. Using this information we can protect the fishery and predict future vulnerabilities. Our research underscores the need for multi-scale indicators that focus on socioeconomic dynamics of natural resource systems that are predictive and responsive.

809. Relationships Between Plumage Phenotypes and Parasite Infections in Barn Owls

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Emma Fitzpatrick Olivia Choi Motti Charter Ran Nathan Rauri Bowie Pauline Kamath

Faculty Mentor: Pauline Kamath

Abstract: Avian haemosporidian parasites are blood parasites that infect many wild bird species including barn owls (Tyto alba). These blood parasites can cause considerable threats to survival such as decreased reproductive success, hatching success, and overall body condition. Research has examined how parasite prevalence and abundance impacts phenotypic trait variation for individuals in a population. While many studies have linked the appearance of male barn owl's plumage to parasite resistance, it is also important to examine these relationships in females. Therefore, the purpose of this study is to explore the relationship between plumage and avian haemosporidian parasite infection in both male and female barn owls. The objectives of this study are to (1) determine whether the absence or presence, diversity, and intensity of haemosporidian blood parasite infections differs between males and females, while also considering the effects of age and body mass on a bird's infection status, (2) explore whether a bird's plumage spot pattern is correlated with the diversity and intensity of haemosporidian blood parasite infections, and (3) evaluate how parasite intensity is linked to reproductive success. Lab work is ongoing but we expect to see an association between parasite presence or absence and plumage traits with owls displaying fewer spots on their plumage to have a greater abundance of parasites. These results will provide insight into how phenotypic traits and parasite infections relate in barn owls and expand our knowledge of variation in parasite infection due to host factors.

810. Developing an Enhanced Forest Inventory in Maine Using Airborne Laser Scanning: The Role of Calibration Plot Design and Data Quality

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Stephanie Willsey David Sandilands Aaron Weiskittel Daniel Hayes

Faculty Mentor: Daniel Hayes

Abstract: Accurate and reliable inventories of forest resources are critical in developing and carrying out strategies for sustainable management. Where high data quality is coupled with effective calibration, remote sensing has emerged as an essential tool for measuring and monitoring forest resources. In this proposed study, we will investigate a range of forest inventory designs to determine the best ground-based calibration plot specifications for developing enhanced forest inventories (EFIs) based on airborne laser scanning (ALS) data. While development involving ALS-derived EFIs has been advanced in some parts of the world, research is required to determine "best practices" in applying these approaches to the mixed-species, structurally complex, and intensively managed forests of Maine. To do this, we will test the effects of varying calibration plot type and design on EFI model performance as applied to several areas of interest across the state. We will evaluate the different forest inventory designs based on both quantitative model performance as well as implementation efficiency to establish the optimal calibration plot design for ALS in our study areas. Once the best forest inventory calibration plot design is identified and validated, it can be applied to estimate a suite of forest inventory attributes (e.g., tree count, hardwood/softwood composition, basal area, and volume) that are required across numerous research and operations applications. We expect the optimal calibration plot design to vary spatially because Maine has several different forest ecotypes with a range of disturbance histories.

811. Greenhouse Gas Fluxes from Deadwood in Northeastern Forests

Submission Type: Virtual Presentation

Submission Category: Natural Sciences

Author(s):

Zoe Read Jodi A. Forrester Ivan Fernandez Jay Wason Christopher W. Woodall Shawn Fraver

Faculty Mentor: Shawn Fraver

Abstract: Global climate change has emphasized the need to better understand carbon emissions. However, major gaps still exist in our understanding of forest carbon dynamics, including the rate at which trees release stored carbon after they die. The objective of my research is to fill this knowledge gap by quantifying CO2 emissions from stumps, logs, and soils and investigating the factors that control these emissions, including time since tree death. To accomplish this, I measured CO2 emissions directly from deadwood using a greenhouse gas analyzer connected to chambers attached to logs, soil, and a chronosequence of stumps in conifer forests of central Maine. Our results indicate CO2 emissions from decaying logs did not differ significantly from those of adjacent soils (p > 0.05). Stump CO2 emissions increased to a maximum at 8 years post-harvest, then decreased through year 32. When scaled up to a per-area basis, stumps emitted about 2.2 ± 2.1 g C/m²/yr. In contrast, carbon emissions from decaying logs contributed about 42.6 ± 23.8 g C/m²/yr, or 3.8% of total ecosystem respiration, due to their greater surface area. Using these data, we can determine the rate at which trees release stored carbon after they die, and how much this offsets CO2 uptake by live trees. Our results point to the need for further research on deadwood carbon dynamics, as stump and log emissions appear to be overlooked and underrepresented in forest carbon models and budgets. Overall, these empirical data can inform process-based models of forest carbon dynamics.

812. Bridging the 'Great Disconnect': Overcoming Methodological Hurdles in the Use of eDNA to Study Food Web Interactions of American Lobster Larvae

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Curtis Morris Peter Countway Alex Ascher David M. Fields Richard A. Wahle

Faculty Mentor: Richard A. Wahle

Abstract: The spawning stock biomass of the American lobster (Homarus americanus) in the Gulf of Maine is at record high levels. Paradoxically, benthic recruitment of young-of-year lobster has declined precipitously since 2012, suggesting a disconnect during the planktonic stages. Recent studies identified a climate change-related regime shift in the Gulf of Maine's pelagic food web resulting in declines in the abundance of the copepod Calanus finmarchicus, a foundational prey species and an important link between primary production and higher trophic levels. Furthermore, correlative evidence suggests C. finmarchicus is a limiting food source for larval lobster in the Gulf of Maine. Currently however, larval diets in nature are not well studied, and conventional microscopy does not provide sufficient taxonomic resolution of stomach contents. High-throughput DNA sequencing presents a powerful molecular tool to identify specific taxa within complex marine communities. As part of a large collaboration evaluating larval lobster trophic interactions, in this study we develop a methodology to characterize the components of the larval diet. Here we optimize the application of a lobster-specific peptide nucleic acid blocker to reduce host DNA interference while identifying larval stomach contents by (1) determining the optimum concentration of blocker for use in PCR assays, and (2) determine blocker cross-reactivity, that is, whether the blocker errantly suppresses the amplification of closely related prey DNA. These experiments will help establish protocols for the application of future DNA sequencing to study larval trophic ecology, and in this case help us test the food limitation hypothesis.

813. Utilizing Landscape Design Principles to Improve Green Spaces and Promote Ecotherapy on a College Campus

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Jessica Hutchinson

Stephanie Burnett

Faculty Mentor: Stephanie Burnett

Abstract: As students in Maine are subject to harsh winters and a disconnectedness due to the pandemic, the creation of an ecotherapy focused garden may benefit the community at the University of Maine. Mental health is a rising concern within the United States, where anxiety has been the most common among students at 62.7% from a survey conducted by the Center for Collegiate Mental Health (Son, C., et al., 2020). Ecotherapy is the practice of holistic psychology where healing is derived from interactions with the surrounding ecosystem (Summers, J. and Vivian, D., 2018). Through literature review and gardening, this creative project provides a green space on campus with the potential to supplement psychological treatments related to mental health. Landscape design principles and horticultural practices were implemented to create an interactive space that provides a pleasant place for the community. Plants were chosen based on aesthetic value, ecosystem services, and functionality with the space. Community members were invited to participate in gardening, hanging bird seed, and strolling through while sipping tea to promote awareness and interactions with the garden. With assessments of plant health, mortality, and functionality, the space will continue to grow to be an inclusive place for all. The improved garden has therapeutic potential through the use of ecosystem services, especially in the context of the pandemic.

814. Uncovering the Mycorrhizal Connections Between Mature Trees and Seedlings of Ancient Red Spruce Forests on a Coastal Maine Island

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Evan Warburton

Pete Avis

Faculty Mentor: Pete Avis

Abstract: Mycorrhizal fungi are a group of fungi that form symbiotic relationships with trees by colonizing their root tips. In this project, the extent of this mycorrhizal connection is being explored in ancient red spruce forests on a coastal island of Maine. Since mycorrhizal fungi play a vital role in the life of trees, gaining knowledge of the mycorrhizal relationship will allow us to better understand and interact with Maine forest ecosystems. To date ,I have conducted DNA extraction, PCR, and gel electrophoresis on over 400 colonized root samples and the sequencing of these samples is in progress. In my presentation, I will report on the subsequent bioinformatic analysis of these sequences that will identify mycorrhizal fungi colonizing the roots. I will also present a comparison analysis to assess the extent at which the mature spruce trees are connected to the spruce seedlings by way of these mycorrhizal fungi.

815. Assessing Microplastic Risks in Maine's Agricultural Systems

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Denise Cole Anne Lichtenwalner

Faculty Mentor: Anne Lichtenwalner

Abstract: Recent research suggests that terrestrial environments may be significant sinks for microplastics (MPs). Current graduate research from the University of Maine establishes that MPs are present in agricultural environments in Maine. It was hypothesized that Maine farmers would be unaware of and unconcerned about microplastics potential presence on their farms. An anonymous online survey was created to test this hypothesis and to understand how Maine farmers perceive MPs. The survey was shared via the UMaine Cooperative Extension lists and Facebook farming groups. The survey inquired about farmers' management practices, perceptions of MP risks, and their future actions in response to MPs. A total of 98 individuals took the survey. Based on survey responses, the hypothesis was not supported; a majority of farmers are aware of MPs and $\sim 30\%$ of them believe that there is potentially an issue with them on their farm. A majority of Maine farmers are conscious of their plastic usage on the farm and have a desire for safer alternatives. Around 32% of farmers claimed that they would probably or definitely discuss this issue with their peers. A large majority of farmers also claimed that they would further research MPs, be more aware of how plastics are used on their farms, and try to limit the amount of plastic used on their farms as a result of taking this survey. A better understanding of MPs is necessary to incentivize farmers and provide them with alternative products and management practices that minimize MP contamination on their farms.

816. Initial Descriptions of the Microbes of Farmed Atlantic Sea Scallop (*Placopecten magellanicus*) Veligers and Rearing Tanks

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Sarah Hosler Erin Grey Adwoa Dankwa Jennifer Perry Tim Bowden Brian Beal Suzanne Ishaq

Faculty Mentor: Suzanne Ishaq

Abstract: Atlantic sea scallop is the second largest fishery in Maine, primarily through wild harvest. Since wild scallop harvest is periodic, farming is seen as a way to meet year-round market demands. Farmers rely on wild-caught spat, however, as larval survival in hatcheries are low for reasons not completely known. To explore the role of larval microbiomes in hatchery success, our long-term goal is to compare the microbiome of wild and farmed scallop veligers. Wild scallop presumptively have the constituents of a healthy microbiome, and by comparing this to the farmed veligers we hope to be able to inform more successful scallop spawning and rearing methods in hatcheries. Many different factors such as diet, environment, and health influence the microbiome of all organisms, these same factors could be influencing the survival of the scallop larvae. Therefore, there is most likely a connection between the function of the veliger microbes and why they do not have a high survival rate in hatchery tanks, giving us insight on how to change aquaculture practices to be more successful. Bacterial microbiome communities in veliger-stage larvae and rearing tank biofilms were obtained by prokaryote 16S rRNA gene sequencing metabarcoding, and variation in the composition and function among wild and hatchery microbiomes will be explored visually and with statistical tests in the R statistical platform. The impact of Vibrio bacterial growth in the scallop tanks is being

investigated as a possible cause of low hatchery success. Initial Thiosulfate-Citrate-Bile-Sucrose (TCBS) plates with suspected Vibrio colonies from Atlantic deep-sea scallop larvae rearing tanks in an aquaculture facility were collected from the Downeast Institute (DEI) in Machias, Maine.

817. Investigation of the ca. 1100 BP White River Ash Eruption in the Denali Ice Core Record

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Hanna Brooks Karl Kreutz

Faculty Mentor: Karl Kreutz

Abstract: The eastern White River Ash eruption is regarded as a well characterized eruption, making it a key marker when developing sedimentary and ice core chronologies. However, preliminary tephra analyses in the Denali Ice Core 2 indicate that previous research assigning two explosive eruptions from the Mt. Churchill stratovolcano to the ash layer may not be entirely accurate. Four prominent sulfate peaks with corresponding tephra matching the chemistry of White River Ash have been identified in ice ranging from 185.05 - 187.77 m deep (890 - 1091 BP). Efforts are currently underway to determine if the tephra grains preserved in the ice core record are indeed the result of two explosive eruptions, or if Mt. Churchill was erupting more consistently over a longer period of time between 800 and 1200 BP.

Tephrochronological analyses using electron beam instrumentation employ the novel cryptotephra sampling methodology developed at UMaine. To identify the White River Ash, four sulfate microparticle concentration increases around 1100 BP were analyzed for tephra present. The ice was melted and filtered using 0.2 µm filters. The cryptotephra grains are currently being examined using secondary and backscattered electron imaging on the scanning electron microscope, with semiquantitative analyses conducted by an EDS detector. Completed SEM/EDS analyses have provided a chemical fingerprint of cryptotephra matching the White River Ash, when compared with published major and minor element values. To further verify these findings, accurate chemistry will be determined using epoxy mounted tephra samples on the electron probe micro-analyzer.

818. Characterization and Modification of Residual Biochar Sourced From Maine for Application Wild Blueberries

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Abigayl Novak Jessica Hutchinson Ling Li

Faculty Mentor: Ling Li

Abstract: Biochar as a soil amendment has been extensively studied over the past decades. It has a porous structure, a relatively large surface area, multiple functional groups (e.g.-COOH group), and abundant mineral elements, and more. These attributes make biochar an excellent soil addition, which can retain water in the soil, delay nutrients leaching from the soil, modify the pH, improve ventilation and permeability of the soil, and immobilize heavy metals. The effects of biochar additions on the improvement of water and nutrient retention capacity of sandy soil are significantly greater than other soil types, such as clay soil. However, a high pH of raw, fresh biochar (9<pH<11) would result in lower acidity of the sandy soil in wild blueberry fields, which is not favorable for the growth of the blueberry crops. This study aimed to investigate the characteristics of biochar to evaluate if it can be amended into the sandy soil to improve the water retention and wild blueberry plants' resilience to drought but does not alter the pH of the soil too much. Woody biochar produced using local forestry biomass as a byproduct of uncompleted biomass combustion was studied due to the abundance of forest resources in Maine. Properties such as, bulk density, porosity, surface area, pH, water holding capacity, and nutrient retention were measured. A neutralization/acidification pretreatment process was studied to modify the pH of raw biochar. Results revealed that the Maine based residual biochar has the ability to increase water holding capacity and nutrient retention. The pH of biochar was decreased to 7 or less after dissolving about 60% of metal salts in the biochar using a 2% concentration of acidic acid.

819. Isolating and Identifying *Staphylococcus* Bacteriophage From the Black Soldier Fly Larval Gut

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Audrie French

Edward Bernard

Faculty Mentor: Edward Bernard

Abstract: Black Solider Fly (*Hermetia illucens*) larvae (BSFL) are being increasingly used as a sustainable high-protein feed alternative for aquaculture, poultry, and swine. They are authorized as feed in the US for salmonids and poultry. Much of the current research on BSFL is focused on the efficacy and viability of the insect as a feed source, but the larvae also have an important effect on the bacteria within their feed (substrate). Research in this vein is less extensive but has shown that certain bacteria are present in significantly lower concentrations in substrates upon which larvae are feeding (Bernard, Villazana, Alyokhin, & Rose, 2020). When using BSFL as feed for animals, especially if those animals are going to be processed into food products for people, the effects the larvae have on the bacterial populations of their substrate must be considered. One facet of BSFL suppression of bacteria that has not yet been widely studied or characterize bacteriophage that infect pathogenic bacterial species that the larvae have been shown to suppress, such as *Staphylococcus aureus* and *Escherichia coli*. Isolating and characterizing such bacteriophage would allow further investigation of their possible role in suppression.
820. COVID-19 and Outdoor Recreation in Maine and New Hampshire: Analysis of Trends Using Passive Visitation Data

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Andrea Knapp

Jessica Leahy

Faculty Mentor: Jessica Leahy

Abstract: The COVID-19 pandemic has motivated alterations to the way people approach and practice outdoor recreation. Access to outdoor areas has changed rapidly in response to measures like travel bans, closures, and health and safety guidelines. Recreation managers have had to act quickly to keep up with these usage fluctuations in order to protect resources from use degradation. We explored how pandemic effects have changed visitation behaviors and trends in outdoor recreation in Acadia National Park and the White Mountain National Forest. Acadia National Park is a well-known and highly trafficked outdoor recreation area with over 3 million visits annually and many entries and exits; the White Mountain National Forest, has similar diffuse entries, has diverse recreation opportunities, and sees less overall visitation than Acadia. This study includes a review of relevant literature on COVID-19 effects on outdoor recreation, an analysis of survey data from 2020 about COVID-19 impacts to Acadia visitors, and an exploration of the use of passive use cellular data for visitation estimates in management practices. This paper is unique in that it includes passive use cellular data for examining visitation shifts during the pandemic in diffuse entry outdoor recreation areas. Results indicate that in addition to an overall increase in visitation to these outdoor recreation areas, pandemic visitation saw shifts in dispersal. The passive use cellular data was useful in estimating visitation within recreation areas. It is likely there will be several areas where recreation managers could incorporate these results and data gathering techniques into their operations to improve existing outdoor recreation practices.

821. Cosmogenic Isotope Analysis of Basal Sediment found in Mt. Hunter Ice Cores

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Katie Westbrook Karl Kreutz

Faculty Mentor: Karl Kreutz

Abstract: As glaciers and ice sheets around the world continue to melt, the impact on sea level and coastal societies will become ever more dire. Understanding the relationship between atmospheric temperature and ice volume is therefore imperative for accurate predictions of future change. One approach to this problem is to reconstruct ice volume during times of high atmospheric temperature in the past, and therefore gain understanding of glacier sensitivity to temperature. In this project, I will combine data from glacially deposited boulders collected in the Wind River Range, Wyoming and ice cores recovered in the Mt. Hunter ice plateau in Denali National Park, Alaska. Seven glacial boulders were sampled using an established drilling technique and will be further crushed and cleaned to obtain pure quartz. The quartz will then undergo beryllium-10 analysis to reveal the dates in which they were deposited by a past retreating glacier. Data is expected to date back to the termination of the last glacial maximum (about 15,000 to 40,000 years before present), and specific dates are expected to reveal the rate of glacial retreat. From the ice core, pebbles and sediment will be extracted and processed using the same cosmogenic isotope analysis as the glacial boulders. This date will reveal how long ice has covered Mt. Hunter plateau. Temporal information collected from both sites will provide insight into past temperature conditions and global processes driving localized climate. Here I present a concept map of the proposed project methods and preliminary conclusions.

822. The Effect of Climate Change and Topography on Tropical Glaciers

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Samuel Holbrook Alice Doughty

Faculty Mentor: Alice Doughty

Abstract: Glaciers grow and shrink with changes in climate over time, leaving behind moraines, which mark past glacial extents. In Sierra Nevada del Cocuy of Colombia (6°N, 72°W), many moraines have been dated to the Late Glacial period (~15,000 - 11,000 years ago), which occurred during the abrupt transition between the last ice age and modern climate. We used a numerical model based on glacial physics in MATLAB to reconstruct past extents. Model input included current elevation, climate data, and changes in temperature, lapse rate, and precipitation. We modeled over one hundred past climate combinations and compared the modeled glacial extent with the dated moraine record in ArcGIS. In addition to quantifying Late Glacial climate in this area, we are investigating how topography influences glacial length response to a change in climate. Our future projections suggest that a 3°C warming would melt all of the glaciers in this tropical mountain range.

823. Blood Parasite Co-infections Associated with Anthrax Mortality in Plains Zebra

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Allison Weymouth Logan Christian Hannah Lembree Claire Nowak Melanie Prentice Pauline Kamath

Faculty Mentor: Pauline Kamath

Abstract: Bacillus anthracis is a gram-positive bacterium that is often found in soil and causes the disease anthrax, which can result in severe illness and death in animals and humans. Plains zebras (Equus quagga) in Etosha National Park, Namibia, are disproportionately affected by this pathogen. Inherited genetic factors, landscape ecology, and seasonal factors may influence a host's susceptibility to anthrax. Our primary objective is to understand how co-infecting pathogens, such as blood parasites, may increase the susceptibility of zebras to anthrax. We will achieve this by genomic sequencing of 10 anthrax-positive carcass tissues (cases) and 10 blood samples (controls). Genomic sequences are currently being filtered by exclusion of sequences aligning to the host genome. The remaining, unmapped sequences will then be used to identify the following blood parasite genera with BLAST: Anaplasma, Theileria, Babesia, Ehrlichia, and Plasmodium. We expect to find B. anthracis in anthrax-positive mortalities, as a validation of the method. We also expect to identify additional blood parasites in plains zebras that may play a role in host susceptibility to anthrax. This data will facilitate further research on the role of co-infection on the risk of mortality in plains zebras infected with B. anthracis. We expect our results to lead to developments in pathogen discovery, host susceptibility, and microbial community dynamics.

824. Comparative Analysis of *Primnoa Pacifica*, Red Tree Coral, Gamete Size Before versus After Thermal Variability Events

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Jocelyn Cooper

Rhian Waller

Faculty Mentor: Rhian Waller

Abstract: Cold-water corals in the deep ocean can be keystone species, forming habitats that support other species which are vital to the health of the whole ecosystem. Cold-water corals are generally long-lived and therefore vulnerable to changes in their environment. Thermal variability in the ocean is a process by which water temperatures are in constant flux, either natural or human influenced. The coral Primnoa pacifica, Red Tree Coral (RTC), has been studied extensively in the Gulf of Alaska (GOA) to understand its reproduction to predict if it will withstand changing environmental conditions. Recent research data collected from RTC communities in shallow Alaskan fjords indicates thermal variability has adversely impacted reproduction and growth but effects on deep sea populations are unknown. RTCs are both diverse and abundant in the eastern GOA fjords where they emerge to as shallow as 6 m, as well as on the continental shelf edge and on seamount ecosystems at depths greater than 150 m. For this study, a comparison was made to understand if there was a difference in deep population gamete size between samples collected before versus after a thermal variability event called the "Blob" that passed through the GOA from 2013-2015. Results from this study indicate there is no significant difference between sperm nuclear diameter before versus after the phenomenon which could suggest these corals are more resilient to thermal variability. Further research could be valuable in assessing and predicting the impact of global climate change on this species inhabiting deeper waters in the future.

825. Income and Food Insecurity within Households: Evidence from a Universal Income Transfer

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Prianka Sarker Caroline Noblet Angela Daley

Faculty Mentor: Angela Daley

Abstract: Food insecurity adversely affects multiple dimensions of health and well-being across various stages of life. Previous studies have demonstrated that income interventions alleviate household-level food insecurity. However, little is known about how these policies affect adults and children within the households, respectively. Our objective is to estimate the relationship between income and food insecurity separately for adults and children using the Universal Child Care Benefit (UCCB) as an exogenous income shock. Based on data from the Canadian Community Health Survey (2005-2012) and employing a difference-in-differences methodology, our results indicate that the UCCB reduced the probability of being marginally, moderately, or severely food insecure at the household, adult, and child levels. For example, after the policy change, the probability of experiencing severe food insecurity decreased by 17% at both the household and adult-levels. Moreover, the likelihood of facing severe food insecurity decreased by 50% for children (from 0.20% to 0.10%). Our results expand previous findings on household-level food insecurity, showing the differential effect of income support programs on food insecurity among adults and children, respectively. Improved understanding of the impact of income transfers on the prevalence and severity of food insecurity across and within households allows for informed and potentially targeted interventions.

826. Assessing Mg/Ca as a Key to Past Ocean Temperature in the Southern Jordan Basin, Gulf of Maine

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Alexandria Thompson Madelyn Woods Alicia Cruz-Uribe Katherine Allen

Faculty Mentor: Katherine Allen

Abstract: The Holocene is a geologic epoch spanning the past ~11,000 years, and in some regions it is punctuated by abrupt environmental changes. The Gulf of Maine, however, currently has no continuous record of ocean temperatures spanning this time. New studies have shown that this region has undergone rapid warming and cooling in recent decades, but with limited paleotemperature data the long-term natural dynamics of this region remain unclear. Foraminifera, a marine microorganism, can be used to investigate this issue as their calcium carbonate shells contain chemical signatures of the past environment and are well preserved in the sediment that accumulates on the seafloor. This project has combined trace element ratios (Mg/Ca, B/Ca), stable isotopes (δ 18O), and radiocarbon (14C) data to determine whether an existing temperature calibration and carbonate-ion correction (Morley et al., 2017) for Neogloboquadrina incompta, a planktic foraminifer species, yields accurate ocean temperatures. These modern samples are from plankton nets and surface sediment in the Gulf of Maine's Jordan Basin. This comparison will determine if paleotemperatures can be accurately predicted using the same calibration. A new methodology has been developed to analyze Mg/Ca by laser-ablation inductively coupled plasma mass spectrometry (LA-ICPMS) in the MAGIC Lab at the University of Maine, and preliminary geochemical data have been collected. Radiocarbon dates on specimens from surface sediments confirm that the material is of modern age (between 0 ± 20 (1 σ) and 35 ±15 calibrated years BP), and may therefore reasonably be compared with recent cruise and buoy data.

827. Reconstruction of Historical Glaciers in Scotland

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Elyeah Schweikert Alice Doughty

Faculty Mentor: Alice Doughty

Abstract: The Cairngorm Mountains of Scotland (57°N, -3°W) do not currently have glaciers, however, there is clear geological evidence that they once did. The transition between the last ice age and the modern climate included the Younger Dryas event (~12,900 to 11,700 years BP), which was a time of abrupt climate change and likely impacted the human civilizations that existed in the area. We used MATLAB to reconstruct past glacier extents that matched geologic samples obtained by our international colleagues. Model inputs include elevation, modern climate data, and changes in temperature and precipitation. Our results depict changes in glacier area over the last 13,000 years BP due to a range of possible temperature and precipitation combinations. We are now able to compare these estimates of past temperature and precipitation change with other climate reconstructions in Scotland and the greater North Atlantic region.

828. Anaplasma Prevalence and Distribution in Maine Moose Populations

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Zachary Pecora Alaina Woods Pauline L. Kamath

Faculty Mentor: Pauline L. Kamath

Abstract: Anaplasma is a genus of bacteria that attacks the blood cells of the host and poses a threat to wild and domestic animals, as well as humans. Moose in Europe and the United States have been shown to be infected with Anaplasma. In Maine, moose populations may be declining, a current trend that has been attributed to severe winter tick infestations. Anaplasma infections can cause several health problems in wildlife and domestic livestock, including anemia and fetal abortion, and may further reduce the survival of moose stressed by severe winter tick infestations. However, little is known about the current distribution, risks and prevalence of Anaplasma in Maine moose. The objectives of this study are to determine the distribution, prevalence, and risk factors of Anaplasma infection in Maine moose. We collected whole blood samples from moose and used molecular methods to estimate Anaplasma prevalence within the moose population. Furthermore, generalized linear models (GLMs) were used to assess risk factors for Anaplasma infection in moose. The prevalence found within the population (n = 120)was 34.2%. There were 41 Anaplasma positive samples from 12 different wildlife management districts (WMD) in Maine, the majority of which (29.2%) came from WMD 5. With the information gathered from this study, Maine wildlife biologists and managers can determine what course of action should be taken to help manage disease in Maine moose, as well as better understand the effects of Anaplasma on moose health.

829. Development of Wood-fiber Insulated Panels (WIPs) for Prefabricated Modular Construction and Retrofit Applications

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Jake Snow Benjamin Herzog Samuel Glass Stephen Shaler Ling Li

Faculty Mentor: Ling Li

Abstract: Emerging wood products, such as cross-laminated timber (CLT), and wood fiber insulation (WFI) are sustainable, renewable, and low carbon footprint building products, which have been recognized as alternatives to steel, concrete, and fossil-based insulation, e.g., extruded/expanded polystyrene foam (XPS/EPS). With the first domestic WFI manufacturing plant born in Maine, the University of Maine began a pioneer study to develop a line of wood-fiber insulated panels (WIPs) to be used in modular construction projects and retrofit applications. WIPs will open new markets for Maine timber producers and could be an efficient value-added product using residuals from existing timber processing. CLT and WFI have decent to excellent moisture buffer capacity and water vapor permeability, which can manipulate the microclimate in the CLT and WFI wall assembly and roof assembly. This project aims to quantify the mechanical and hygrothermal properties of WFI alone as well as the WIPs. Building performance data was collected from a building constructed using WFI and cross-laminated timber in Belfast and that data will be used to validate the lab-scale data collected and evaluate the long-term structural health of the building.

830. Assessing the Veterinary Needs of Rural Maine and Implementing an Effective Management Plan

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Marielle Pelletier Tegwin Taylor Sue Ishaq

Faculty Mentor: Sue Ishaq

Abstract: In Maine, the need for veterinarians is at an all-time high; the large animal (NIFA, 2022) and equine veterinary shortage (Parker, 2021) has been documented and there are mechanisms in place to help alleviate this shortage. In January 2022, LD 1885 (An Act To Increase Maine's Veterinary Workforce) was amended to include critical and emergency veterinary service shortages (An Act To Increase Maine's Veterinary Workforce, 2022). Maine has methods to evaluate the shortage of large animal service, but the shortage of companion animal services is not fully described. In order to evaluate Maine's need for small animal services, a needs assessment will be conducted. With implementation of the Pets For Life Community Outreach Toolkit (Humane Society of the U.S., 2021), and by communicating with and surveying veterinary stakeholders in Maine, gaps in veterinary services will be identified. This information will help answer the question: How can the demand for companion animal veterinarians in underserved communities be meaningfully represented and how can those communities be managed appropriately? The long-term goal is to identify stakeholder priorities to address the veterinary shortage. With a better understanding and assessment of veterinary needs in the state, the issue can be organized in a way that is approachable for those outside of the veterinary community, like Maine policymakers, who, alongside the veterinary professionals, will serve a large role in solving the issue and improving veterinary services in rural communities.

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831. How Did Extinct Ice Age Mega-herbivores Affect Soil Nutrient Cycling?

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Noa Buzby Jacquelyn Gill

Faculty Mentor: Jacquelyn Gill

Abstract: During the Quaternary period (~2.5 million years ago to present), environments and ecosystems have gone through major changes, one of which was the extinction of megafauna at the end of the Pleistocene. Investigating the effects these animals had on their environment is key to understanding the impacts of their extinction on ecosystem processes. One way large animals impact ecosystems is the redistribution of nutrients through feeding and defecating. Extinct large herbivores have been hypothesized to increase the rate of nutrient cycling at high latitudes, with cascading effects on vegetation productivity and ecosystem structure. Up to now, the amount of nutrients dispersed was based on estimates due to the impossibility to directly measure the nutrient content of extinct megafaunal dung. This project addresses this gap by quantifying nutrient ratios of dung from several species of extinct megafauna, including woolly mammoths, woolly rhinos, steppe bison, and horses during the last glacial period. I analyzed the ratio of carbon, nitrogen and phosphorus (C:N:P) from 40 coprolites (ancient dung) preserved in permafrost from Siberia. Quantifying nutrient content of extinct Arctic herbivores aims to determine whether nutrient ratios vary by species according to traits such as body size, digestion type and dietary preferences, along with the effect on soil nutrient cycling.

832. Suppression of Methicillin-resistant *Staphylococcus aureus* Using Larvae of Black Soldier Fly, *Hermetia illucens*

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Matthew Moyet Marissa Kinney Edward Bernard Andrei Alyokhin

Faculty Mentor: Andrei Alyokhin

Abstract: Biological conversion of animal and plant wastes into ingredients of animal feeds using larvae of black soldier flies, *Hermetia illucens*, is a rapidly emerging environmentally sustainable technology. Unfortunately, contamination of harvested larvae with pathogenic microorganisms may present a serious problem for its wide-scale adoption. However, there is also mounting evidence that black soldier fly larvae have antimicrobial properties, including suppression of several common pathogens. Most existing studies focused on Gram-negative species, but there is also some evidence of negative effects on gram-positive species. Methicillin-resistant Staphylococcus aureus, or MRSA, are gram positive strains of S. aureus resistant to the antibiotic methicillin. Contamination of meat and dairy products by MRSA has resulted in foodborne infections of humans. We conducted laboratory experiments testing if black soldier fly larvae suppress MRSA on shredded potato substrate as a part of the study investigating their potential for valorizing potato wastes. Potato substrate inoculated with MRSA, potato substrate inoculated with MRSA and containing black soldier fly larvae, and uninoculated potato substrate containing black soldier fly larvae were incubated for three and seven days. Samples were plated onto both trypticase soy agar and on Staphylococcus Medium 110 agar for enumeration of total bacteria and MRSA, respectively. Both total bacterial counts and MRSA counts were reduced in the presence of black soldier fly larvae, with reduction being much more pronounced for the latter. Our findings confirm antimicrobial properties of black soldier fly larvae, which is likely to improve biosafety of its harvested biomass. Furthermore,

future identification of biologically active molecules responsible for this reduction may have important practical applications of its own.

833. Chemical Weathering of Serpentine in a Tropical Environment: Implications for Silicate Weathering on Mars

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Francis Sternberg

Amanda A. Olsen

Faculty Mentor: Amanda A. Olsen

Abstract: Serpentinization - the reaction of ultramafic rock with water to produce magnetite, hydroxide, and serpentine group minerals - releases alkaline fluids that serve as habitat for extremophile microbes. Mantle-derived rocks formed at high temperatures and pressures can rise to the Earth's surface through tectonic processes, where they undergo alteration when in contact with liquid water. This hydrothermal metamorphic process liberates inorganic hydrogen and methane that chemotrophic microorganisms can utilize for metabolic energy in the absence of sunlight; the secondary phases precipitated during serpentinization can preserve evidence of past microbial activity in the form of organic or mineral biosignatures. Because these extreme subsurface environments are known to sustain life on Earth, recent serpentine detections on Mars have garnered attention from the planetary science community, culminating in the Mars 2020 mission to seek signs of ancient extraterrestrial life.

We propose to use the Rio Cupeyes NEON field site in Puerto Rico to study the mineralogy and chemistry of altered serpentinite. This tropical, biotic through-flow setting is a suitable terrestrial analog for past Martian environments (~ 3 gya), when wetter and warmer conditions would have led to serpentinization and subsequent chemical weathering. This project will distinguish chemical weathering textures from mineral products precipitated during serpentinization. Soils and rock clasts sampled from a 1.1-meter-deep road cut are analyzed to determine the distribution of trace and major elements as a function of depth and host mineral phase. We hope this study will yield information regarding the timing of the weathering process and provide other observations needed for comparison to samples observed by the Mars 2020 Perseverance rover.

834. The Role of FNPs Within Primary Care in Providing Pregnancy Options Counseling

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Natalie Nicols Eva Quirion

Faculty Mentor: Eva Quirion

Abstract: Pregnancy options counseling (POC) presents all options to pregnant people in a non-directive, unbiased manner. Options include parenting, abortion, and adoption. This capstone evaluates the use of POC across the U.S. among providers including family nurse practitioners (FNPs) working with childbearing aged individuals, racial disparities surrounding POC, policy impacts, and POC training. Providers may refrain from regularly presenting POC and abortion referrals. POC and referral training isn't routinely required among providers. Political changes, such as with Title X, create barriers to delivering POC within publicly funded family planning facilities throughout the U.S. A literature review was conducted using 11 studies and one article. Results revealed providing POC is crucial for pregnant people and desired by most and demonstrated support for the effectiveness of POC and referral training in helping providers deliver POC and appropriate referrals. Although numerous studies suggest POC for unintended pregnancies, two studies established it's best practice to deliver POC to all pregnant people. One study found Black patients were less likely to be counseled on all options, particularly abortion, leading to unfulfilled health needs. FNPs in primary care can play a pivotal role in ensuring pregnant people receive non-directive POC and appropriate referrals so these individuals can make informed decisions that meet their needs and more broadly eliminate disparities. Restrictive laws and recent alterations in Title X necessitate the involvement of FNPs in policy to promote changes at the organizational, state, and federal level regarding the need for POC and referral training among providers across the U.S.

835. Comparison of Seasonal Climate Change Patterns Among the Wild Blueberry Fields at Different Counties of Maine, USA

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Sam Roberts Rafa Tasnim Yongjiang Zhang

Faculty Mentor: Yongjiang Zhang

Abstract Wild Blueberry barrens have been facing the threat of climate change during their growing season (summer). While summer climate variations are affecting this important commercial crop system directly, drastic climate variations in other seasons could potentially hurt this crop growing at different locations in Maine. Therefore, we analyzed seasonal temperature and precipitation trends of the wild blueberry barrens at different counties (Piscataquis, Washington, Hancock, Knox, Lincoln, Kennebec, York) of Maine from 1980 to 2020. We found that across all blueberry production counties, historical temperatures have been increasing significantly in the fall and winter followed by summer, but not in spring. However, precipitation historically has been slightly increasing in the winter and fall, whereas no changes were found in the spring and summer. Further, we found that historical temperatures have been lower in the Piscataquis and Washington county whereas barrens in other counties farther south (from Hancock to York) have been experiencing relatively warmer climates. These results will inform the wild blueberry growers at those different locations about the climate extremes their crops have been facing due to climate change in order for them to prepare and manage their lands during different seasons accordingly.

836. Prevalence of Heat Stable Staphylococcal Enterotoxins in Mastitis Isolates in Maine

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Autumn Hunter Anne Lichtenwalner

Faculty Mentor: Anne Lichtenwalner

Abstract: Pasteurization has been the gold standard for food safety for over 100 years following its invention. High temperature short time (HTST) pasteurization is commonplace in the United States, and involves heating raw milk to 72 degrees Celsius for approximately 15 seconds. The purpose of this procedure is to kill any pathogenic bacteria present in milk, however, many strains of *Staphylococcus aureus* produce enterotoxins that are heat resistant; some survive up to 28 minutes in temperatures up to 121 degrees Celsius. Although pasteurization can kill *S. aureus*, enterotoxins produced by the bacteria may still be present and active.

While infrequently diagnosed, enterotoxins produced by strains of *Staphylococcus aureus* are a common cause of food poisoning across the world. With a growing concern about zoonotic spillover of livestock-associated methicillin-resistant *Staphylococcus aureus* (LA-MRSA), *S. aureus* infections in livestock may become even more difficult to treat. Likewise, some clonal complexes of LA-MRSA, such as CC398, may cause asymptomatic infection in cattle, leading to asymptomatic transmission to farmers and contamination of milk. If some strains of *S. aureus* can cause mammary infection (mastitis) in cattle, how many of them produce heat-stable enterotoxins, or possess antimicrobial resistance genes, and what risk does that pose to food safety in Maine?

Materials and methods for this study are to be determined, but will utilize established methods (Reverse Passive Latex Agglutination, Enzyme-Linked Immunosorbent Assays, or PCR). Samples will be derived from existing *S. aureus* mastitis isolates, and from Maine milk samples (bulk tank and clinical single cow samples).

837. The Effects of Heat Stress, Land Use, and the Expansion of Ixodes Ticks on Pathogen Emergence

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Joseph Beale Sue Ishaq Danielle Levesque Pauline Kamath

Faculty Mentor: Pauline Kamath

Abstract: Ixodes genus ticks often serve as vectors, playing a key role in the transmission of pathogens to wildlife and human hosts. Due to climate and land use change in parts of the United States, this genus of ticks is increasing its range, introducing pathogens into new areas, and remaining viable in the environment for an increased amount of time throughout the year. In this study, we review and synthesize the scientific literature on the factors influencing range expansion of ticks and the emergence of tick-borne pathogens. We also reviewed what is known about how ticks transmit infections to wildlife and human hosts as well as how ticks, mammalian hosts and pathogens have coevolved. Furthermore, we conducted a pilot study in the Spring and Summer of 2021 to examine tick-borne pathogen prevalence in rodents in agricultural and forested environments across a temperature gradient in Maine. In this study, small mammals (n=33), were trapped, and tissue and fecal samples were collected. Whole genomic DNA was extracted from tissue and a multiplex quantitative real time PCR assay was conducted to screen for the presence of Babesia, Anaplasma phagocytophilum, and Borrelia burgdorferi, the causative agents of babesiosis, anaplasmosis, and Lyme disease, respectively. We found that of the 17 tissue samples collected, 11 were from Peromyscus maniculatus and only one sample was positive. This sample was positive for both Borrelia burgdorferi and Babesia microti.

838. Antioxidant Effects of Winterberry (*Ilex verticillata*) Leaf Extract in *Caenorhabditis elegans*

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Cara McKinnon Brendan Moline Michael Croft Leah Mastrianno Samuel W. Caito Jennifer L. Newell-Caito

Faculty Mentor: Jennifer L. Newell-Caito

Abstract: Epidemiological studies have shown that long-term diets rich in polyphenols – plant secondary metabolites - might act as antioxidants due to their ability to offer protection against the development of cancers, cardiovascular diseases, diabetes, osteoporosis, and neurodegenerative diseases. The holly plant genus Ilex contains 15 species native to North America, including Ilex verticillata, or winterberry. Native American tribes in the Northeast United States have historically used winterberry leaves as a medicinal tea, leading to the hypothesis that these leaves may contain beneficial antioxidant properties. A polyphenolic extract was created by drying and distilling freshly harvested winterberry leaves. Total phenolic content (TPC) was determined to be $524.45 \pm 1.82 \ \mu g \ gallic/mL$ of extract. Using Caenorhabditis elegans as an in vivo model, an LD50 was determined and used to pre-treated worms with 0.1%, 1%, or 5% extract followed by treatment with known oxidants manganese(II) chloride (MnCl2) and juglone. The antioxidant effect of the extract was examined by measuring total reactive oxygen species (ROS). In the presence of the extract, there was a two-fold dose-dependent decrease in the total ROS generated by 50 µM MnCl2 and a significant reduction in total ROS generated by 100 µM juglone treatments. A lifespan assay was performed to evaluate the impact of the extract on C. elegans survival over time. Kaplan-Meier analysis suggests a protective one-day mean survival time of the extract in response to MnCl2. These

results suggest that the polyphenolic compounds in winterberry leaves act as antioxidants in vivo.

839. How Do Direct Seafood Marketers Label The Marketing Channels They Engage With?

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Talia Moore Josh Stoll Sahir Advani

Faculty Mentor: Josh Stoll, Sahir Advani

Abstract: Approximately 158 million metric tons of seafood is landed worldwide every year (Future of Fish, 2015) and 36% is then traded across international borders. With the increase of global trade there is a growing acknowledgement that local, regional, and domestic distribution is important to sustaining the booming fisheries and the communities that depend on them. The question presented for research is what do the supply chains look like for seafood businesses that are involved in local and direct seafood distribution in the United States? Within the study there were fifteen interviews that were conducted with seafood businesses. After conducting the interviews, we then developed a "typology" of the different pathways for the local and direct sales. We found that the first and most prominent supply chain revolved around finfish caught from an individual's personal fishing boat and ends with the finfish product being sold via online orders, to restaurants and to farmers markets. The second largest was shellfish via personal fishing boats and ends with them being sold to farmer's markets, restaurants, online orders, and wholesalers. The third least prominent was seaweed which was harvested from personal aquaculture farms and distributed to wholesalers, online orders, and supermarkets. Taking into consideration the results, we concluded that finfish were the most common product sold, which was then followed by shellfish and then seaweed. Based on preliminary research we found that 80% of all domestic seafood that is moved in the US is finfish and the rest is shellfish. Our data showed these same results with 61.5% of products being moved domestically being finfish and 28.2% being shellfish. With the numbers being close enough to the national averages we can accept that our numbers are equivalent to what is going on in the nation's domestic seafood industry. After looking at these results, the further step would be to ask the question of how direct seafood marketers label the marketing channels they engage with? I am currently working on this part of the project now and will be looking through direct marketers' websites to see what sales options/marketing channels they list and see how this coincides with my previous research by still using the same methods but at a potentially greater sample size.

840. Integrated Pest Management for the Control and Prevention of Gastropod Vectors on Pastures

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Rachel White Denise Cole Anne Lichtenwalner

Faculty Mentor: Dr. Anne Lichtenwalner

Abstract: Gastropods can act as intermediate hosts and vectors of important parasites of livestock (e.g. meningeal worm [Parelaphostrongylus tenuis; P.tenuis]). Where white-tailed deer (WTD; the definitive host for *P. tenuis*) habitat overlaps with livestock grazing areas, risk for P.tenuis transmission increases. P. tenuis can replicate in WTD without causing harm; in contrast, it is often fatal in livestock (accidental hosts). In this study, alternative methods were evaluated to reduce P. tenuis risk to pastured livestock. Pastured poultry were examined for reduction of gastropods in a before-after-control-impact (BACI) treatment. 200 Rhode Island Red laying hens were rotated every 4 days in a 25,000 sq. ft. pasture. Gastropods were surveyed on transects before and after bird rotations. Additionally, a mowing treatment was used to examine effects on gastropods in a snail-abundant area. Gastropods on mowed (treatment) or unmowed (control) pastures were assessed in a random complete block design (RCBD) with three treatments (1-year mow, 2-year mow, and control). Poultry significantly reduced gastropods on pasture (paired t-test P<0.01). Mowing significantly reduced gastropods (P=0.015 and P<0.01; repeated measures ANOVA; pairwise comparison with p-adjusted Bonferroni correction) in two of three trials. The third, and latest in the calendar year, survey found insufficient gastropods in both treated and untreated sites, resulting in no significance. These treatments may provide practical and organic integrated pest management methods for the mitigation of terrestrial gastropod vectors in pastured settings.

841. Using Paleolimnological Tools to Evaluate the Links Between Climate Change and CyanoHABs in Maine Lakes

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Avery Lamb

Jasmine Saros

Faculty Mentor: Jasmine Saros

Abstract: Concern over increases in cyanobacterial blooms, the toxins (cyanotoxins) they can produce, and climate change's effects on these increases are becoming more prevalent in the Northeast U.S. Gloeotrichia, a toxin-producing, bloom-forming taxon, has already been identified in many Maine lakes, including in drinking water sources and recreational areas. Maine has a unique climate setting, with lakes situated across three climate zones, and the state is experiencing some of the most significant winter warming in the country. Paleolimnological study of lakes through established proxies such as photosynthetic pigments and newer proxies, such as sedimentary DNA (sedDNA), can produce data over longer temporal scales, offering a more accurate picture of long-term cyanobacterial abundance. This research uses pigment and sedDNA records at a decadal resolution across lakes in Maine that vary in trophic state and climate zone to assess drivers of cyanobacterial harmful algal blooms (cyanoHABs) over the past 150 years. Specifically, the objectives of this research are to 1) Describe how the interactive effects of trophic state and climate change have altered cyanobacteria abundance in Maine lakes, and 2) Investigate how decades of warmer winters have specifically affected Gloeotrichia populations in Maine lakes over the past 150 years. The sediment cores collected will produce the longest time series of Gloeotrichia occurrence in a collection of lakes. A deeper understanding of the changing climate's effects on cyanobacterial abundance and potential cyanotoxin occurrence on expanded temporal scales in Maine is necessary for management of valuable recreational and drinking water sources in the future.

842. A Social-ecological Examination of Seasonal Dynamics in the Maine Lobster Fishery

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Emily Fitting Teresa R. Johnson Yong Chen

Faculty Mentor: Teresa R. Johnson

Abstract: The American lobster (Homarus americanus) fishery is one of the most valuable single-species fisheries in the US, with the majority of lobster landings coming from Maine. Bottom temperature and salinity affect important lobster life history processes, including migration patterns, growth rate, and reproduction. Because of this, the lobster fishery exhibits strong seasonal patterns—historically, most inshore lobster fishing is done from July through November. However, changing environmental factors, including climate change, are causing a shift in lobster phenology, which in turn is causing a shift in the seasonal dynamics of the fishery. Previous research raises concerns about the social resilience of the lobster fishery in the face of these changes. The goals of this research are to examine social and ecological drivers of changes in seasonal dynamics and to explore the social resilience of lobster harvesters. First, researchers will conduct a statistical analysis of seasonality of lobster landings to develop empirical models that can be used to predict future changes in the fishery. Second, the social and economic dimensions of seasonality will be explored through an analysis of a 2018 mail survey and oral history interviews. Preliminary results show a change in the timing of peak lobster landings compared to historical trends, with the qualities of these changes differing across coastal counties. Given the Gulf of Maine is changing rapidly, it is critical to understand how these changes will affect the lobster resource, harvesters, and their communities in order to adequately prepare for and adapt to expected changes.

843. Evaluating the Relationship Between Wild Turkey Movement Ecology and Roads

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Kyle Smelter Stephanie Shea Pauline Kamath Kelsey Sullivan Erik Blomberg

Faculty Mentor: Erik Blomberg

Abstract: An estimated one million vertebrate animals per day are killed along roads in the United States. Wild turkeys (Meleagris gallopavo silvestris) are a large upland game bird that often selects roadside habitats. Despite an annual increase in vertebrate vehicle mortality, turkey populations are increasing in Maine. State and federal agencies face the challenge of managing a sought-after species while balancing risk to human property and well-being. Perhaps the best tool that state agencies can use for the management of a species which persists at the human-wildlife interface is rigorous scientific research. Preliminary results show a clear correlation between wild turkey habitat selection and roads. Furthermore, 13371 GPS points occurred within 800 meters of the nearest road, 1097 occurred between 801-1600 meters from the nearest road, and 1070 occurred between 1601 and 2400 meters from the nearest road (n=15538). These findings represent a small sample size but could suggest a broader risk of increase in turkey vehicle collisions, as well as other human dimensions conflicts that arise with the management of an increasing wildlife population.

844. Social-ecological Effects on Mosquito Populations Across Land Use in Bangor, Maine

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Megan Schierer Allison Gardner Sandra De Urioste-Stone

Faculty Mentor: Allison Gardner

Abstract: Land use, land cover and human behavior (e.g., management of water containers) drive mosquito abundance and species distribution, affecting risk of human exposure to mosquito-borne disease (MBD). Interactions between ecological and social risk factors in the Northeast US remain understudied, even as cases of MBD rise. This research assessed environmental and human dimensions of mosquito distribution and resident mosquito exposure risk at 40 sites across land use zones in Bangor, Maine, an emerging area of MBD transmission. Thirty participants were recruited from urban residential, low-density residential and rural residential property zoning categories. Additional field sites were selected from wooded city forests commonly visited by residents. To describe mosquito distribution across land use categories, we trapped adult mosquitoes and identified juvenile mosquito habitat at participant properties and city forests from June – August 2021. To understand human knowledge driving behaviors surrounding mosquitoes, participants completed a Knowledge, Attitudes, and Practices survey in September 2021. Mosquito abundance peaked the weeks of June 28 and July 19. The highest number of mosquitoes were collected in recreational city forests followed by properties in rural residential zones. The lowest number of mosquitoes were collected on properties in low-density and urban residential zones. We expect to find a relationship between survey results on property-owner knowledge and behaviors and the amount of juvenile mosquito habitat identified on properties. By integrating ecological and human dimensions of mosquito exposure risk, we will define disease risk across land use and inform public health education efforts in Bangor.

845. Recyclable Bio-based Composites with Excellent Oil and Water Barrier Properties for Food Serving Applications

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Rakibul Hossain

Mehdi Tajvidi

Faculty Mentor: Mehdi Tajvidi

Abstract: Recyclable cellulose nanofibril (CNF) and lignin-containing cellulose nanofibril (LCNF) coated wood flour composites were fabricated using a vacuum-filtration process for food serving applications. The coated cellulose nanofibril composites had excellent mechanical, oil, and grease barrier properties compared to a commercial container. However, the composites with both LCNF and CNF coating layers had poor performance in wet conditions compared to the commercial container. The addition of 1 wt.% aluminum sulfate (alum) to the CNF and LCNF coating layer significantly improved the water resistance of the composites. CNF +1% alum-coated composites had inferior water resistance and lower mechanical strength in wet conditions compared to the commercial container. However, the LCNF +1% alum coated composites had comparable water resistance and higher wet mechanical properties than the commercial container. The recyclability of the composites was assessed through the disintegration of the samples in water and subsequent reformation, and it was found that the composites were fully recyclable. The composites could fully retain their mechanical and excellent oil and grease barrier properties after each recycling level. Overall, the fully bio-based nanofiber coated wood flour composites with recyclable properties can be an eco-friendly replacement for commercial oil, grease, and water-resistant food containers that normally use long-lasting unsustainable chemicals to enhance such properties.

846. Aim for Slug-cess: Testing Mitochondrial DNA Sequencing Methods for New England Nudibranch Species

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Ian Birchler De Allende

Erin Grey

Faculty Mentor: Erin Grey

Abstract: Sea slugs, formally known as nudibranchs, are important because their populations can inform scientists about how healthy their environment is due to their sensitivity to environmental disturbances. Nudibranchs are difficult to identify without a high level of expertise, allowing for mistakes to be made when monitoring their populations. These mistakes can be avoided through the use of reference genomes that an individual nudibranch's DNA can be compared to, in order to accurately identify its species. However, most nudibranchs have yet to have their genetic information fully sequenced, making it difficult for scientists to obtain accurate monitoring data. This project focused on developing sequencing methods for mitochondrial DNA for common nudibranch species in the Gulf of Maine in order to provide reference genomes that can be used for future nudibranch environmental monitoring and genetics studies.

847. The Effect of Drying on the Survival of *Escherichia coli*, *Listeria innocua* and *Bacillus cereus* on Sugar Kelp

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Richa Arya Jennifer Perry Denise Skonberg

Faculty Mentor: Jennifer Perry

Abstract: Sugar kelp (Saccharina latissima) is a brown macroalga widely harvested in Northeastern US. Drying can improve the microbial quality and shelf life of sugar kelp by reducing water activity and moisture content. However, the effect of this process on bacterial pathogens of significance is not well characterized. In this study, the effect of controlled drying conditions on the survival of pathogen surrogates Listeria innocua, Bacillus cereus and E. coli inoculated on sugar kelp was investigated. Fresh sugar kelp was washed and cut into blades of uniform size (15 cm). Each blade was inoculated with 107 log CFU/g inoculum level of L. *innocua*, *B. cereus* and *E. coli* (separately) and dried in a convective dryer at various parameters: two temperatures (40°C, and 50°C) and relative humidity levels (25% and 50%) to one of two target final water activities (0.3 and 0.5). Survival of L. innocua, B. cereus and E. coli on inoculated dried samples was assessed using cultural techniques. One-way ANOVA (p<0.05) was used to evaluate the effects of treatment temperature, relative humidity, and water activity on the reduction of inoculated pathogens. Drying treatments at different drying conditions significantly reduced the population of L. innocua, E. coli and B. cereus on the inoculated sugar kelp. Drying at 50 °C, 50%, 0.3 resulted in the maximum reduction of E. coli ($4.24 \pm 0.15 \log$ CFU/g), L. innocua $(3.36 \pm 0.94 \log \text{CFU/g})$. However, 40 °C, 25%, 0.5 parameters resulted in the maximum reduction of $4.64 \pm 0.05 \log \text{CFU/g}$ in *B. cereus*.

848. Turning Recycled Cardboard Containers into High Gas Barrier UV-protective Packaging Film

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Md Ikramul Hasan Jinwu Wang Mehdi Tajvidi

Faculty Mentor: Mehdi Tajvidi

Abstract: Cellulose nanomaterials are considered as one of the promising alternatives to current petroleum-based packaging materials attributed to their ability to form dense self-assembled structures imparting high gas barrier properties, i.e. low oxygen permeability. However, the high cost of the raw materials and production is considered as one of the major challenges for the commercialization of nanocellulose in packaging applications. In this work, we prepared self-standing films of lignin-containing cellulose nanofibril (LCNF) derived from recycled old corrugated cardboard (OCC), which costs one-tenth of softwood Kraft pulp and requires only half the energy for refining to obtain a similar fine content as CNF made from bleached Kraft pulp. The low surface charge of OCC-derived LCNF (-3.83 mV) resulted in aggregation of the fibrils in aqueous suspension, leading to considerable unpredictability in oxygen permeability values (coefficient of variation 36%). The addition of carboxymethyl cellulose (CMC) at 3 wt% minimized the coefficient of variation to 16% with an average oxygen permeability of 1478 (cc.µm/m2.atm.day) at 80% relative humidity. Because the oxygen permeability was higher than that of the CNF film made from bleached Kraft pulp, we demonstrated that ionic crosslinking with A13+ or covalent crosslinking with polyamide epichlorohydrin could greatly decrease oxygen permeability while also increasing mechanical strength. Like other LCNF films, OCC-derived LCNF film is expected to have UV-protectiveness due to the presence of lignin. Our research demonstrates the use of OCC-derived LCNF as a low-cost, low-energy alternative to virgin wood pulp-derived CNF with equivalent oxygen barrier properties.

849. The Incidence of Staphylococcus aureus Mastitis in Maine Dairy Cattle

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Morgan Belvin Anne Lichtenwalner

Faculty Mentor: Anne Lichtenwalner

Abstract: This project investigates the factors surrounding the incidence of Staphylococcus aureus (SA) mastitis in Maine dairy cattle. This type of mastitis is driven by an antibiotic resistant pathogen that is very contagious among cattle. Farmers are unaware of how common this type of mastitis is, and are unaware that it could be present in their herds. My hypothesis is that specific farm factors, like milkers performing other tasks during milking, as well as the act of pre-dipping vs not pre dipping, will explain the increase in SA mastitis. A thirty-nine question IRB-approved survey was distributed to farmers in the University of Maine Extension contact list and farmer Facebook groups. With a total of 11 responses, SA mastitis was seen in farms that do and do not pre-dip, in those whose milkers do not palpate the cows' udder before unit removal, and those where the cow is allowed to lie down shortly after being milked. In addition, seven of the survey respondents had a history of SA mastitis and only two of them were able to eradicate it from their herds. Overall, the results showed that SA mastitis occurs on both small and large scale farms, and there are areas of management that could be changed to decrease the presence of SA mastitis; like the frequent changing of gloves and the palpation of the udders before the unit is removed. This project showed that SA mastitis is common in Maine, and farmers are still unaware whether this pathogen is infecting their herds.

850. Response of Low (Wild) and Highbush Blueberries to Extreme Drought: Threshold of Coordinated Declines in Physiological Processes and Branch Dieback

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Pratima Pahadi

Yongjiang Zhang

Faculty Mentor: Yongjiang Zhang

Abstract: Although the frequency and severity of drought is increasing across North-eastern (NE) US, we lack a mechanistic understanding of the thresholds for irreversible declines in physiological function and plant dieback of blueberries native to this region. Here, we explore how different plant physiological processes (turgor loss, stomatal conductance, photosynthesis rate, transpiration rate, photochemistry, plant hydraulics) respond to declining stem water potential (*Ystem*; a measure of water status and xylem tension within the plant) and soil moisture conditions when two lowbush population (Ang 1 and Ang 2) and two highbush varieties (Bluecrop and Patriot) of blueberries are exposed to extreme drought. Blueberries showed a coordinated response of all the physiological processes under declining 4 stem and soil moisture conditions; all the population- varieties reduced their stomatal conductance to the minimum levels before the turgor loss point of nearly -2.0MPa and after turgor loss point there was a progressive decline of photochemistry (Fv/Fm) until plants experienced extreme drought at 4.5 Pstem of nearly -4.5 MPa and soil moisture of less than 5%. Although Ang 1 and Patriot showed 100% loss of hydraulic conductivity (PLC) while Patriot and Bluecrop showed the highest mortality rate. However, lowbush populations had high regrowth of new stems from rhizomes compared to highbush varieties, indicating the resilience of lowbush populations. These findings highlight the need to consider -2MPa 45tem and 5% soil moisture as the threshold of irreversible declines in physiological function and plant dieback for the management of wild blueberries in fields since blueberries may not recover after passing this threshold.

851. Identifying Umbrella Species to Inform the Conservation of Intertidal Areas in Acadia National Park.

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Abigail Muscat Bik Wheeler Elliot Johnston Brian Olsen

Faculty Mentor: Brian Olsen

Abstract: The nearshore ecosystem in Maine supports several resident and migratory bird species who rely on intertidal and subtidal zones for roosting and foraging, including fall migratory shorebirds. Additionally, during the Maine winter the coastal areas of Acadia National Park include some of the continental United States' highest densities of both Purple Sandpipers (Calidris maritima) and Harlequin Ducks (Histrionicus histrionicus), and all these species may be negatively affected by increasing rates of rockweed (Ascophyllum nodosum) harvest in the state. This undergraduate honors thesis investigated nearshore bird communities during winter and fall migration and identified patterns of intertidal usage within and across species. Bird abundance surveys were conducted across Acadia National Park (ANP) at 31 randomly selected sites, determined using a Generalized Random Tessellation Stratified (GRTS) sampling scheme, during the winter and late summer 2021 to account for differences in seasonal-use patterns. This project also served as a pilot test of a long-term monitoring protocol for nearshore bird species in ANP to track the health of their avian resources. Preliminary analysis revealed that the detection of gamebirds is influenced by wave intensity, observer, temperature, and season, and there is a possible connection between migratory shorebird occupancy and Purple Sandpiper and/or Harlequin Duck presence and absence. These findings could be used to determine if closing some areas of the park to rockweed harvesting are more likely to benefit multiple species, informed by the identification of an umbrella species, a species that has similar habitat requirements to other species but a wider spatial need.
852. The Effect of Education on HPV Vaccination Status in Females

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Madeline Manfredonia Shannon Brunken Lindsay Bland Gabrielle Gamache Brianna Rambo Valerie Herbert

Faculty Mentor: Valerie Herbert

Abstract: In female patients ages 9-26, do public health campaigns by school nurses regarding the HPV vaccine increase rates of vaccination compared to no public health campaigns? The human papillomavirus (HPV) vaccine was approved for females over a decade ago, but the rates of vaccination are lower than other routine vaccinations. In 2019, 54.6% of females aged 13-15 years had received 2 or 3 doses of human papillomavirus (HPV) vaccine as recommended compared to 90.8% of children receiving the measles, mumps, rubella (MMR) vaccine (1+ doses). Like other immunizations, the low rates of vaccination are related to lack of knowledge and fear. The HPV vaccine has been controversial in the past based on the belief that vaccinations would promote promiscuity among those who received it. Vaccination against HPV matters as HPV is estimated to cause nearly 36,000 cases of cancer every year in the United States. The HPV vaccination can prevent 33,000 of these cancers by preventing the infections that cause them. This paper explores the idea that adequate education is vital in increasing HPV vaccination rates in females ages 9-26. A literature search was conducted using the CINAHL database and Medscape to find peer-reviewed journal articles. The keywords used in our search were HPV vaccination and HPV education. Written and verbal education tools have been found to be successful. Widespread community education using resources that are supported by community members may increase the rates of vaccination compared to women who received no education.

853. Effects of *Vibrio Parahaemolyticus* and *Aeromonas hydrophilia* on the Development of Black Soldier Fly Larvae.

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Grace Harman Matthew Moyet Bernard Edward

Faculty Mentor: Bernard Edward

Abstract: Black soldier fly larvae (BSFL) are organisms capable of decomposing organic wastes that may be contaminated with pathogenic organisms. *Vibrio Parahaemolyticus* and *Aeromonas hydrophilia* are gram-negative bacteria that thrive in salty, warm environments. These bacteria can be present in ground water, water treatments plants, within aquatic animals, and concentrated in fish digestive tracts. Based on previous work, these bacteria may be detrimental to the survival of BSFL, resulting in significant weight lost and mobility. BSFL will be fed a potato substrate either alone, or added along with *Vibrio Parahaemolyticus* or *Aeromonas hydrophilia*. Bacterial counts, substrate volume, larval weight gain and larval mortality will be analyzed throughout the experiment. Furthermore, substrate and larvae will be isolated and subjected to genomic investigation using RNA sequencing to asses the activity of BSFL immune larval genes. By assessing BSFL under stress conditions, a potential immune pathway or gene can be identified that help us better understand how BSFL are capable of decomposing contaminated organic wastes.

854. Effects of Nanocellulose Treatment in Drought Response of Maine Wild Blueberries

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Aldous Hofmann Yongjiang Zhang

Faculty Mentor: Yongjiang Zhang

Abstract: Four genotypes of Vaccinium Angustifolium (one species of Maine Wild Blueberry) from three soil types via Wyman's Blueberries in Deblois, Maine were treated with a 250 mL mixture of crystallized nanocellulose (CNC) materials via aerosolized spray and subjected to 18 days of induced drought conditions in a controlled greenhouse environment. Soil water content (SWC) and crop physiology were measured during the drought treatment. Drought induced plants showed significant declines in both pre-dawn water potential (YP) and mid-day water potential (ΨM) around the two week (14 day) mark wherein SWC was observed to be under 5% in drought, compared to approximately 20-25% under control (no drought treatment). WP was found to be more highly variable than ΨM in the difference between non-CNC treatment and CNC treated plants. CNC treated and non-CNC treated controls showed little to no difference. No significant difference was found in soil temperatures, fluorescence (Fv/Fm), or chlorophyll concentrations (via SPAD) between any replicants. A longer treatment period wherein significant declines in physiological performance observed in the non CNC-treated plants drought is needed to confirm a positive effect of CNC treatment on overall plant health during induced drought. However, these findings suggest that a low-cost CNC based treatment can be used to improve the water availability in drought conditions lasting for a period of two weeks or longer. Further testing is also required to determine which CNC material, or a mixture of CNC material was effective.

855. The Comparison of Management Practices to Control Intestinal Parasites in Companion and Production Pigs

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Kianna Dean

Anne Lichtenwalner

Faculty Mentor: Anne Lichtenwalner

Abstract: Many individuals become pig owners without knowing how to properly care for them, resulting in health- related setbacks due to poor diet, unmanaged environment(s), or other less than optimal health conditions due to negligence. This can negatively affect human health, since pigs host the highest number of zoonotic diseases of any livestock animal (CDC, 2017). In Maine, parasites such as coccidia, *Toxoplasma gondii*, hookworm, and ascarids affect both production and pet pigs; some are of zoonotic importance.

Since 2000, over 60 pig cases have been diagnosed by the University of Maine Cooperative Extension Veterinary Diagnostic Laboratory (UMVDL) via necropsy, fecal evaluation or PCR, to prevent further sightings of poor health in Maine pigs. In approximately 48% of cases, gastrointestinal parasites were found. We hypothesized that porcine management methods are predictive of parasite burdens in Maine pigs. In the first part of this project, a survey was created for Maine production and household pig owners about how they raise their animals. In the second part of this project, diagnostic cases were evaluated to further characterize mistakes in management (ongoing).

Fifty-three responses to the survey were utilized, coming from 14 of Maine's 16 counties. A third of pigs were kept on pasture. Of 48 respondents, 21% kept pigs as pets and 75% for production pigs. Five of 6 respondents whose pigs had gastrointestinal parasites raised solely production pigs. If the adjustment of certain management practices proves to reduce internal parasites, both pigs and humans can benefit from improved health.

856. A Study on the Mechanical Behavior of SDCNFs Reinforced PP Composite

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Sungjun Hwang Collen Walker Yousoo Han Douglas Gardner

Faculty Mentor: Douglas Gardner

Abstract: Cellulose nanofibrils (CNFs) derived from wood or plant fibers can be classified as eco-friendly materials and considerable research activity on the utilization of CNFs as a reinforcing filler in polymer matrices has been reported. BKP, UKP, and OCC are good feedstock sources for manufacturing cellulose nanofibrils via mechanical treatment. To properly apply CNFs in various applications, a proper CNF drying method should be developed. Spray drying is fast, simple, cost-effective and scalable so it is used in various industries including the pharmaceutical, food, and chemical manufacturing. Among the different techniques of spray-drying, the pilot scale-rotary disk atomizer has many advantages such as large capacities and also drying efficiency at lower pressures and less feed blockage. In this study, Bleached kraft pulp (BKP), Unbleached kraft pulp (UKP), and Old corrugated cardboard pulp (OCC) were spray-dried through a rotary disc atomizer. Then the produced Spray-dried cellulose nanofibers (SDCNFs) were applied to a polypropylene (PP) matrix as a reinforcing material, and the MAPP was used as a coupling agent. A master batch was used for the optimal dispersion and distribution of SDCNF and MAPP in the PP matrix. It was confirmed that the tensile, flexural, and impact strength properties increased with SDCNF was added to the PP matrix.

857. Abstract Moved to Biomedical Sciences

858. Linking Molecular Deadwood Inhabiting Fungi to the Decomposition Rates of Coarse Woody Debris

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Elyse Daub

Peter Avis

Faculty Mentor: Peter Avis

Abstract: The decomposition of wood is driven by a combination of abiotic and biotic factors, the most influential of them all are fungi. These decomposer fungi use the wood for food, digesting woody material to absorb nutrients and release carbon dioxide. Fungi are the primary drivers of decomposition in most terrestrial ecosystems; thus, the rate and degree of decomposition are greatly dependent on the community of fungi found on woody debris. However, little is known about which fungi decompose woody debris most efficiently. This study aims to investigate the decomposer fungi in the Bear Brook Watershed via molecular techniques and quantify their rates of decomposition to understand which fungi are the most effective decomposers. Early data suggests the distance of proxy decay stakes may impact the rate of decomposition and the addition of nitrogen may have little to no impact on the rate of decomposition. Results regarding fungal species identifications and distributions are currently pending as of the writing of this abstract.

859. Evaluation of Preservation Techniques for Kombucha Starter Cultures

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Adwoa Dankwa

Jennifer Perry

Faculty Mentor: Jennifer Perry

Abstract:

Introduction:

Kombucha has gained popularity due to perceived health benefits including probiotics to antimicrobial properties. Production requires a starter culture (SCOBY) comprising complex bacteria and yeast populations. The SCOBY self-propagates for use in sequential brewing cycles. Commercially available SCOBYs used in kombucha production have a short shelf-life as there are currently no known long-term preservation techniques. This precludes producers reliably sourcing a consistent microbial consortium for fermentation. There is, therefore, the need to evaluate and identify preservation techniques that would ensure longer storage of cultures for distribution and maintenance of the quality and integrity of the cultures. This study evaluates preservation techniques and their effects on microbial stability, recovery, and survival after storage.

Method:

Three SCOBYs were obtained from commercial suppliers (n=2) or homebrewers (n=1). Each culture system was propagated by brewing following a simplified standard recipe. Newly propagated SCOBY samples were collected at pH 3 and underwent size modification by various degrees of blending (fine paste and small particulate). Unmodified samples received no size modification. 4 SCOBY sample sets, each consisting of unmodified, fine paste, and small particulate samples were subjected to 1 of each treatment group: no preservation(control), vacuum drying (40 oC), freezing (-20oC) or freeze-drying (-20 oC, 30 min/0.6mbar, 48 hr). Samples were enumerated for acetic acid bacteria (AAB) and yeast on selective media using the thin-layer method. Data were subjected to ANOVA and bar plots for visualization.

Results:

Unpreserved cultures were not significantly affected by SCOBY size modification in either yeast (3.07-3.61 LogCFU/g) or AAB (3.08-3.18 LogCFU/g) populations. Microbial populations were significantly affected by preservation techniques and interaction of preservation techniques with size modification. Yeast and AAB populations were undetectable after drying in all sample types. Yeast populations ranged from 1.33-1.90 LogCFU/g in only blended modified frozen and freeze-dried samples with no counts in unmodified samples.

Significance:

These data suggest that particle size reduction increases survival of yeast cells and should be integrated into SCOBY preservation strategies. Drying, freezing, and freeze-drying of SCOBY adversely affect the stability and viability of microbial culture. This suggests the need to incorporate protectants prior to preservation to maintain the integrity of preserved samples.

860. Post-Harvest Treatment Effects on Physicochemical Properties and Composition of North Atlantic Squid

Submission Type: Virtual Presentation Submission Category: Natural Sciences

Author(s):

Caitlin Hillery Denise Skonberg

Faculty Mentor: Denise Skonberg

Abstract: The primary objective of this research is to characterize the compositional differences between two North Atlantic squid species, Illex illecebrosus and Doryteuthis pealeii, based on post-harvest processing procedures such as freezing methods and brining methods ubiquitous in the calamari industry. Other objectives include determining compositional differences between edible portions (mantles and tentacles); determining compositional and quality differences between unfinished product (whole squid) and processed product sold to consumers (cleaned, brined, and refrozen mantles and tentacles); and comparing the compositional and quality impacts of two different freezing methods (plate freezing at sea vs. blast freezing on land) on the squid. Contents of moisture, crude protein, soluble protein, and ash were determined through standard methods following dissection and homogenization of squid subsamples. Instrumental color was evaluated using a Hunterlab colorimeter to determine L*a*b* values, and instrumental texture was measured using a TA-X2i texture analyzer. This research also focuses on measures of protein quality: water-holding capacity was determined by a standard centrifugation procedure, and in-vitro protein digestibility will be performed on freeze-dried mantle and tentacle samples. The effects of all independent variables have been, and will be, analyzed statistically with ANOVA, with p < 0.05. Analyses are ongoing; however, moisture analysis has indicated that processed squid samples exhibit higher moisture contents than whole animals, and nitrogen analysis has suggested significant effects of all independent variables on crude protein content. These squid are the only two species in the world that have been certified sustainable by the Marine Stewardship Council, and this research will allow fisheries to insure product quality, optimize their procedures for handling, storage, and processing, and potentially directly or indirectly reduce food waste in the industry.

861. Hoxb5 Genes May Promote Muscle Precursor Migration in Zebrafish Embryos

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Sophie Craig Tayo Adekeye Cecilia Moens Jared Talbot

Faculty Mentor: Jared Talbot

Abstract: During embryonic muscle development, some cells migrate away from somites to give rise to the limb musculature and to muscle in other positions like the neck and tongue. Muscle precursor migration requires function of the homeodomain genes Six1 and Six4. However, Six1 and Six4 expression is found broadly, in all muscle precursors, and it remains unclear why only some muscle precursors migrate while most do not. In zebrafish, muscle precursors only migrate from a region of the anterior trunk called "occipital somites." Since Hox genes are known to govern anterior-posterior patterning, we hypothesized that specific Hox genes may activate the migration of these occipital cells. Published expression patterns suggest that hoxb5a and hoxb5b may be specifically expressed in the migratory muscle precursor cells. During a GSBSE rotation, I did preliminary analysis on muscle precursors in hoxb5a mutants, hoxb5b mutants and in the hoxb5a;hoxb5b double mutant. In the two single mutants, these occipital cells were mildly reduced and in the hoxb5a;hoxb5b double mutant they are around three-quarters the wild-type size. These findings suggest that both hoxb5 genes promote muscle precursor migration. Although other Hox genes likely also activate occipital muscle precursor migration, our work with these Hoxb5 genes may be a first step towards understanding how these muscle precursors become particularly responsive to pro-migratory signals.

862. Disinfestation Methods Affect Development of Early Peach Embryos in Tissue Culture

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Courtney Hawkins Bryan Peterson

Faculty Mentor: Bryan Peterson, Renae Moran

Abstract: Peaches are one of the most in-demand summer fruits in Maine. Growing peach trees is a risky endeavor due to their flower's susceptibility to be ruined by frost despite the recent warmer winters. Therefore, the development of more cold hardy varieties that can consistently perform in Maine's climate will support orchard growers in Maine and support the state's economy. Using peach breeding by hybridization of peach genotypes, producing a plant with superior traits is possible. This all starts with rescuing immature seeds from early ripening fruits by using tissue culture. The peach genotype 'Bailey', was selected for hybrid breeding due to its tolerance to spring frosts. Different disinfestation methods were tested to ensure the best results, and 70% Ethanol proved to be the most reliable. Test tubes were prepared full of growing medium to provide the seed with plenty of nutrients to grow despite its access to water and sunlight. When the seeds began to root, they were moved from their tubes to fresh soil and placed in the Roger Clapp greenhouse. By improving breeding in seeds wherein both parents are late-ripening peach varieties, it can result in greater percentages of hybrids that are alike, or even later-so flowering than their parents. To date, these plants are being monitored for growth and will be the beginning of a rewarding project that expands the growing range of this fruit into regions that are prone to frost.

863. Abstract Moved to Biomedical Sciences

864. Abstract Withdrawn

865. Non-Narcotic Pain Interventions and the Effectiveness of Decreasing Pain

Submission Type: Poster

Submission Category: Engineering and Information Sciences

Author(s):

Sarah Brindisi PhilAnn Dixon Bridget Gessner Lauren Dergoatis Kelley Strout

Faculty Mentor: Kelley Strout

Abstract: PICO Question:

In adult patients experiencing pain (P), would non-narcotic pain interventions (I) as compared to an opioid medication regimen (C) be effective in decreasing pain (O)?

Topic and Purpose:

Throughout the United States of America, opioids are a first line treatment for chronic pain management especially postoperatively. Around 30% of patients with pain who are prescribed opioids will misuse them and 12% develop an opioid use disorder (National Institute on Drug Abuse, 2021). Opioids are prescribed daily to combat moderate to severe pain, which can ultimately lead to addiction and overdose.

Methods:

CINHAL database was used to search words including non-narcotic pain interventions, the effects of opioid medication, national opioid crisis rates, relaxation therapy, addiction and overdose, and chronic pain severity. The main consideration when choosing the eleven articles that were retrieved was eliminating any risk of bias in order to draw conclusions on the efficacy

of non-narcotic pain interventions. This is an accurate approach to provide information based on the amount of literature surrounding the topic before narrowing in and addressing more specific questions related to pain interventions.

Outcomes:

Multiple non-narcotic interventions have shown promising effects in decreasing pain in adult patients. Music and massage therapy are most frequently used interventions along with grouping multiple therapies to benefit the patient. By combining or bundling interventions together such as heat and physical therapy promotes comfort and prevents complications that are often associated with chronic pain. Providers often prescribe opioids to manage chronic pain despite the risk for developing long term dependence. Opioids are a tertiary level of prevention and a downstream measure for chronic pain. It is found that using an upstream approach to treat pain results in more positive outcomes for patients' pain status with efforts to lower the rate of opioid dependence. Music and massage therapy, physical therapy, acupuncture, relaxation interventions, guided imagery, cold and heat therapy along with non-steroidal anti-inflammatory drugs (NSAIDs) are the most common pain management interventions that should be used as an upstream measure.

Recommendations for Nursing Practice:

Nurses and health care providers should advocate for non-narcotic pain interventions because it is an effective upstream pain management approach for adult patients. By suggesting and implementing these strategies, the prevalence of opioid prescriptions may decrease, further lowering the severity of addiction and overdose.

866. A Concept Map of Icefield-to-ocean Linkages in Southeast Alaska

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Katie Westbrook Caeli Connolly Amanda Fay Karl Kreutz

Faculty Mentor: Karl Kreutz

Abstract: Rates of glacier mass loss in Southeast Alaska are among the highest on Earth, and have a range of local, regional, and global impacts. For example, ongoing changes in glacier volume and extent are likely to affect stream flows and chemistry of coastal rivers, which in turn will have impacts on nearshore marine environments in the Gulf of Alaska and water resources. Changes in ice flow can affect erosion rates and tectonic activity in the region, and Alaskan ice loss is making a significant contribution to global sea level rise. In addition, the history of and ongoing changes in ice extent in the region provide important clues to climate processes that shaped Earth's evolution on long timescales (hundreds to tens of thousands of years), as well as important context for recent global warming. To investigate these and other related issues, the ERS410: Sea-to-Sky Experience travel study course will visit Southeast Alaska in May 2022. We are framing our work with the following question: How has ice changed in Southeast Alaska? The goal of this project is to quantify glacier extent and thickness specifically around Juneau. We will employ a range of state-of-the-art data collection techniques including geomorphic mapping, glacial chronology construction using cosmogenic isotope dating, ground- and ice-penetrating radar, and ice coring. Here we present a concept map that details our plans for data collection and comparison with past records and modern models, and explores how the glacial change relates to regional and global processes.

Interdisciplinary Research

901. Comparing Municipal COVID-19 Response in Inland vs. Coastal Communities in Maine

Submission Type: Poster

Submission Category: Interdisciplinary Research

Author(s):

Tamra Benson Ben Cotton Annie Coburn Kathleen Bell Vanessa Levesque Eileen Johnson

Faculty Mentor: Kathleen Bell

Abstract: COVID-19 is an ongoing problem across the world that has required a direct response from all scales of governments. While a national approach is imperative, state and local governments are pivotal in dispersing critical information by tailoring their responses to address local problems. In this research, we looked at the differences between Maine inland and coastal communities in responding to the COVID-19 pandemic. We examined the digital communication response of 50 coastal and 50 inland municipalities, ranging in size from 26 to 25,515 residents, and we interviewed 20 municipalities about their COVID-19 responses. We found that coastal and larger municipalities demonstrated greater digital communications regarding COVID-19 compared to inland and smaller municipalities. However, interviews suggest that many municipalities, regardless of location or size, were able to provide residents with additional resources during the pandemic by forming partnerships within their towns. Our results underscore the importance of municipal governments, in answering questions and resolving issues regarding current pandemic conditions. Thus, through this research, we aim to identify ways to enhance the capacity of municipalities to communicate and provide services during crises.

902. Embodiment as a Theme and Process in Collaborative Research

Submission Type: Poster

Submission Category: Interdisciplinary Research

Author(s):

Jennifer Smith-Mayo Michael Clay Bridie McGreavy Heather Leslie Angela Wotton

Faculty Mentor: Bridie McGreavy

Abstract: The purpose of our work is to center the concept of embodiment in research through describing the fine-grained practices and everyday interactions that shape collaborative research in the contexts of watershed restoration and environmental monitoring. We focus on embodiment because it offers a means for attending to the process and politics of knowledge production within and across disciplinary boundaries. Paying attention to embodied practices among collaborators, such as how we share ideas with each other, or decide what types of questions we ask, can help researchers understand how communication, and embodiment, shape collaboration. We describe these practices by drawing on findings from two case studies. In the first case, we describe insights from a project in the Meduxnekeag Watershed as we worked with partners to design an interview protocol that asks farmers how the act of farming helps them shape relationships with land and water. In the second case, we position research as an embodied action through co-creating a knowledge map to define environmental-DNA. Knowledge mapping relies on embodied processes as participants share ideas and shape research through discussion, listening, learning from each other, and organizing knowledge visually on the map. These cases highlight insights about how scholarly commitments to embodiment emerge amidst increasingly complex research questions involving conservation, sustainability, climate change, and environmental justice. In focusing on embodiment, we summarize opportunities for developing collaborative research relationships by building community partnerships, creating story maps, and developing ethical research practices-such as listening and sharing-in the co-production of knowledge with diverse partners.

903. Promoting Health for Passamaquoddy Tribal Members through Alternative Energy Solutions

Submission Type: Poster

Submission Category: Interdisciplinary Research

Author(s):

Jasmine Lamb Mary O'Flaherty Sharon Klein

Faculty Mentor: Sharon Klein

Abstract: The goal of this research is to co-produce information about what issues Passamaquoddy citizens face inside of the home. Passamaquoddy is the anglicized version of the word Peskotomuhkati, which means "people of the pollock". Today, Passamaquoddy people have two reservations in Maine (Pleasant Point and Indian Township) and one in New Brunswick, Canada, and many individuals live off-reservation. Information was collected from all Passamaquoddy citizens regardless of residence. Knowledge will be co-produced about, for, and interpreted with the community through informal interviews and surveys with citizens of the Passamaquoddy Tribe. Possible alternative energy/technology solutions that can be implemented in the home to address these issues will be explored, as well as the preferences and willingness of citizens to implement possible solutions. Another goal of this research is to assess how the public health of the community is affected by climate change and drivers of climate change such as pollution. The health of indigenous communities who rely on traditional ways of subsistence is inextricably tied to the health of the environment. Passamaquoddy communities face unique challenges to public health (spiritually, mentally, emotionally, and physically) and economic security because of their use of natural resources, such as elvers, clams, brown ash, blueberry crops, etc., which are all affected by climate change. The responses of citizens will be amalgamated into a report to document the needs and preferences of the community and to help inform future projects of which alternative energy solutions are appropriate for and preferred by the community.

904. The Use of Augmented Reality to Monitor Coastal Erosion

Submission Type: Poster

Submission Category: Interdisciplinary Research

Author(s):

Nicholas Sherman Elijah Story Michael Scott

Faculty Mentor: Michael Scott

Abstract: As smartphone technology becomes more powerful, new tools are now available to make scientific measurements more efficient. One of these is Augmented Reality, which uses the smartphone screen to superimpose virtual images on a video feed of the real world. This, combined with built-in LiDAR sensors, allows for new smartphones to map the real world quickly and accurately. By applying this technology to the measurement of coastal erosion, inconsistencies can be eliminated and the process more streamlined. Current methodology involves the use of physical tools (tape measure and GPS devices), followed by manual recording of the information on paper data sheets. Using AR and LiDAR, we have created an iOS application that allows a user to gather measurements quickly and efficiently. Using pre-existing base points established in the real world, the user can place virtual points at fixed increments at a measurement site. The smartphone then automatically creates a virtual baseline and virtual, perpendicular lines along this baseline. The user then simply looks at each line and marks a virtual point on the line to record each measurement, reducing error introduced by non-parallel measurement lines and inconsistent increments. Measurements are stored on the smartphone and automatically uploaded to a database. As a result, coastal erosion measurement is improved. Data is accurately and efficiently collected using only a smartphone, opening coastal erosion measurement for a wide range of users.

905. EDGE AR - Detect Your Surroundings

Submission Type: Exhibit

Submission Category: Interdisciplinary Research

Author(s):

David Lavoie Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: EDGE AR is a hardware software solution designed to enhance and evolve the current state of eyewear. The goal is to display the potential for augmented reality to enhance the modern set of glasses, and shape them up to provide accessibility through edge detection.

This project is designed to show off the future potential of edge detection in pairing with augmented reality glasses. EDGE AR is a proof of concept application that has a Unity Demo, a working Python Prototype, and a mobile application developed for mobile through an application called Expo. The Expo application uses the phone's camera with different overlays to simulate edge detection, and different view augmentations.

The idea was inspired by accessibility and usability as a tool. Low-light situations, hard to see angles, and altered visual sight could be aided by this application. The tool should be used as a visual assistant to create an augmented view of the world that highlights an array of objects for a better differentiation. 906. Bangor Pride Mobile App

Submission Type: Exhibit

Submission Category: Interdisciplinary Research

Author(s):

Alyssa Demanche Jon Ippolito

Faculty Mentor: Jon Ippolito

Abstract: The upcoming Bangor Pride festival and parade brings together a variety of local businesses, restaurants, and community organizations in support of the LGBTQ+ community throughout the month of June. However, a common problem within festivals such as these is that visitors can often feel overwhelmed with the amount of activities and engagements. Working alongside Pride organizers at the Maine Health Equity Alliance (HEAL), a non-profit organization that provides sexual health, wellness services, and harm reduction programs jointly in support of the LGBTQ+ community, a passport app was developed that would act as a single location for visitors to see what types of events and activities are available during the Pride festival. This app will help boost community engagement by promoting local businesses through a scavenger hunt in which users will answer fun questions on quirky details of the store or restaurant they are visiting. The goal is to have participants and community members go and support as many local areas throughout the month with a prize for the biggest Bangor supporter.

907. Detecting Shared Touch Surface Contamination with a Deep Learning-Enhanced Smartphone and Nanopatterned Material System

Submission Type: Poster

Submission Category: Interdisciplinary Research

Author(s):

Ainslie Allen Josh Andle Oisin Biswas RJ Perry Salimeh Yasaei Sekeh Caitlin Howell

Faculty Mentor: Caitlin Howell

Abstract: Shared-touch surfaces can transmit diseases when not cleaned properly. Some methods of surface contamination detection exist, but nearly none are immediately accessible, hands-free, and do not require specialized equipment. This work is focused on building a deep-learning driven, smartphone-based system that interacts with nanopatterned surface appliques and identifies contamination on a surface. We used a nanopatterned material that acts as a diffraction grating and measured the difference in the refracted light pattern when the material was clean and when it was contaminated. Unlike nearly all other applications of nanopatterned diffraction gratings, our applique material is mass-produced by a Maine paper company, making it both able to be applied over large areas and affordable. The light diffracting off our nanopatterned material resulted in bright rainbows which changed significantly in intensity, length, and color composition, as measured with a standard smartphone camera, when the surface was contaminated with oil. Using this system, we were able to detect oil contamination down to a volume of 0.1 µL over a surface area of 64cm2 when the data were processed manually. We then trained a convolutional neural network (CNN), ResNet 50, to detect these differences. The network was able to detect contamination at an even lower volume of 0.0001 µL over a surface area of 64cm2. Training the CNN on the collected data improved the detection performance by over 100%. Additionally, by changing the angle of the smartphone and the light source, we were able to effectively scan the surface to search for areas of contamination

and under ambient light conditions, making it more applicable to use in everyday life. Adding the angle and light features into the CNN method provides extra information to the neural network and leads to a robust learning process. Together, the results demonstrate that a deep-learning-enhanced nanopatterned material system can detect general surface contamination, which may help identify potentially infectious contamination on shared touch surfaces.

908. Understanding Sense of Place in Maine Through Community Cookbooks

Submission Type: Virtual Presentation

Submission Category: Interdisciplinary Research

Author(s):

Rachel Church Susan Smith

Faculty Mentor: Susan Smith

Abstract Community cookbooks have been published in Maine from 1877 to today. As artifacts of a specific community in a specific place in a specific time, they can be used as tools for understanding Maine's sense of place, defined as the socially constructed, multivocal, and ever-changing relationship between the land and those who inhabit it. When compared to commercially produced cookbooks, they give more accurate insight into what people actually cooked and ate in a particular community and time because the recipes are submitted by actual community members as "tried, tested, and proved." Community cookbooks can reveal a relationship to the land and/or connection to greater national and global communities through the use of local ingredients, national packaged brands, and international ingredients or recipes. Looking at multiple cookbooks produced over a period time can show change in these relationships. Additional illustrations and narrative text provide more information on the community's relationship to place. Recipe attribution allows for social connections to be mapped within a community, particularly when cross referenced with additional sources. In addition to documenting the social networks within a community, the act of creating or cooking from a community cookbook is also an active vehicle for creating and strengthening that community. Understanding community cookbooks as artifacts is useful not only in understanding the historical sense of place in a certain time, but they also play a role in place-making by informing an individual's (or community's) understanding of their own history, which provides context for understanding their current relationship with a place.

Biomedical Sciences

1001. Role of Heme Oxygenase in Endurance Neuromuscular Electrical Stimulation Mediated Improvement of Dystrophic Skeletal Muscle

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Amanda Ignacz Elisabeth Kilroy Kodey Silknitter Clarissa Henry

Faculty Mentor: Clarissa Henry

Abstract: Duchenne muscular dystrophy (DMD) is a fatal, progressive muscle-wasting disease that affects 1 in 5000 live male births. DMD is caused by mutations, usually deletions, in the gene coding for dystrophin production. Dystrophin acts as a link between the actin cytoskeleton and the extracellular matrix in myocytes. With a lack of functional dystrophin, as observed in DMD patients, muscle becomes more susceptible to damage as the cells contract and relax resulting in muscle degeneration and weakness. In a zebrafish model for this disease (sapje) it has been shown that the dystrophic phenotype can be ameliorated through endurance neuromuscular electrical stimulation (eNMES), providing insight on the effect of exercise on muscle structure and function. However, the molecular mechanisms of eNMES-mediated improvement in dmd mutants is not well-understood. Heme oxygenase (HO), an antioxidant that has been implicated as a potential therapeutic treatment in both zebrafish and mouse models of dmd, was found to be upregulated with eNMES treatment in both wild-type and dmd embryos in an RNA Sequencing (RNA Seq) study. A knockdown of hmox1a expression in dmd mutants showed no skeletal muscle improvement after eNMES treatment. This suggests that HO is necessary for eNMES-mediated improvement, and a combination of HO treatments and endurance activity could be a potential therapeutic approach to robust improvement of dystrophic muscle in DMD.

1002. Mouse Models of NADK2 Deficiency Analyzed for Metabolic and Gene Expression Changes to Elucidate Pathophysiology

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

George Murray Robert Burgess

Faculty Mentor: Robert Burgess

Abstract: NADK2 encodes the mitochondrial NAD Kinase, which phosphorylates nicotinamide adenine dinucleotide (NAD) to form NADP, an important cofactor involved in a wide variety of metabolic pathways. In patients, rare recessive mutations in NADK2 are associated with a syndromic neurological mitochondrial disease with metabolic problems, hyperlysinemia, neuropathy, and neurodegeneration. Here we describe a chemically induced mouse mutation in Nadk2, S330P, which causes severe neuromuscular disease and shortened lifespan. We observe denervation of neuromuscular junctions by 5 weeks of age and pronounced muscle atrophy by 11 weeks. These mutants also display progressive degeneration of cerebellar Purkinje cells, a histopathological feature of NADK2 deficiency in patients. Metabolomic profiling indicates elevated lysine in brain, liver, muscle, and spinal cord with disruption of NADP-dependent biological pathways. Combined metabolomics and transcriptomics identifies disruption of glycolysis and gluconeogenesis with changes in the abundance of intermediate glycolytic analytes and gene set enrichment analysis indicates deficits in beta-oxidation of fatty acids. These mice broadly recapitulate the pathophysiological features of disease in patients and will be useful for the study of NADK2 deficiency.

1003. Continuous, Non-Destructive Detection of Surface Bacterial Growth with Bioinspired Vascularized Polymers

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Brandon Dixon Anna Briley Caitlin Howell

Faculty Mentor: Caitlin Howell

Abstract: Reducing or eliminating bacteria on surfaces is a vital part of ensuring food safety, drinking water quality, and preventing infection. However, nearly all current methods of bacterial detection are destructive and single-use. In this work, we present a new method to detect bacteria at surfaces that is continuous, non-destructive, and reusable. Inspired by vascular systems in nature that permit chemical communication between the surface and underlying tissues of an organism, metabolites diffusing from surface bacteria were detected in channels filled with a carrier fluid embedded in a polymer matrix. The carrier fluid was analyzed using conductivity, ultraviolet-visible (UV-vis) spectroscopy, and high-performance liquid chromatography; methods that ranged in sensitivity and cost. Using Escherichia coli K12 as a model surface bacterial system, carrier fluid from samples compared to controls with no bacteria exhibited an average increase of 1.27 mS/cm in conductivity, an increase of 0.017 absorbance units at 600nm in UV-vis spectroscopy, and the significant differences in two major peaks in HPLC detected at 254nm. Creating a multilayer polymer optimized the network and allowed the system to be more easily re-used, as the channels could be evacuated and refilled multiple times with carrier fluid for the continuous detection of surface bacteria with similar results to previous single-use experiments. Additionally, bacteria growth could be determined after 8 hours since the application of bacteria to the surface pending channel resonance time and bacteria growth phase. This work lays the foundation for the use of vascularized polymers as an adaptive system for the continuous, non-destructive detection of surface bacteria with multiple methods for analysis.

1004. Characterization of the Human Cardiac Progenitor Cell Secretome

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Michayla Moore Calvin Vary

Faculty Mentor: Calvin Vary

Abstract: Heart Disease (HD) remains the greatest cause of death worldwide. Preclinical evidence has highlighted the potential role of Cardiac Progenitor Cells (CPCs) in regulation of cardiac repair after injury, with an emerging role of CPC secreted proteins in this process. We have been studying CPCs isolated from human left ventricular myocardium characterized by their high proliferative capacity in vitro. These cells (human highly proliferative cells, hHiPCs) are characterized by high expression of CD105/Endoglin. With this knowledge, we hypothesized that hHiPCs associated with improvement in cardiac remodeling after MI will have a secretome characterized by higher expression of pro-angiogenic and pro-proliferative proteins, and these are regulated by the BMP/CD105 pathway. An unbiased proteomics approach (LC-MS/MS) was used in our lab to identify proteins secreted from hHiPCs pre-treated with the CD105 ligand BMP9 (5 ng/mL) compared to non-treated controls. Several pro-angiogenic secreted proteins were identified in clone 11 including CCN2, CXCL6, and TGFB2. We found a significant increase in the secretion of Sclerostin (SOST) in BMP9 treated hHiPC compared to non-treated controls. These data were also confirmed by ELISA and RT-qPCR. Similarly, using LC-MS/MS we found a significant increase in CD105 expression in the membrane fraction of clone 11 compared to clone 22 indicating its potential role in positive heart remodeling effects. The increase in pro-angiogenic factors after BMP9 treatment may suggest the potential relevance of BMP9 treatment in cardiac progenitor cell secretome mediated repair and will be investigated in the future.

1005. Mybl2 is a Developmental Control Gene that Regulates Asymmetry and Dynamic Expression of Genes in the Cochlea

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Caryl Young Matthew Thompson Vidhya Munnamalai

Faculty Mentor: Vidhya Munnamalai

Abstract: The cochlea is an asymmetrically patterned organ that is determined by the interaction of several signaling pathways during the early stages of development. The sensory epithelium has one row of sound-detecting inner hair cells (IHCs) and three rows of sound-amplifying outer hair cells (OHCs). Here, we define a novel role for MYBL2 in establishing radial asymmetry by regulating Jag1, an important prosensory regulator in the medial compartment and Shroom1 in the lateral compartment.

We hypothesize an incoherent feed-forward loop exists in which, Jag1 and Mybl2 are Wnt target genes and MYBL2 feeds-forward to repress Jag1 leading to Jag1 refinement. We also hypothesize that the Wnt-MYBL2 pathway negatively regulates Shroom1, a laterally expressed Bmp candidate target gene. We tested these hypotheses in β -catenin and Mybl2 conditional knockouts (cKOs) on E14.5.

Analysis of Wnt pathway mutants show that Jag1, Mybl2 and Shroom1 are regulated by the Wnt pathway. Mybl2 cKOs show an expansion of the JAG1 domain and its downstream effector, SOX2 that labels the sensory domain, and an increase of Shroom1 on E14.5. These data suggest that MYBL2 represses Jag1 and Shroom1. On E18.5, Mybl2 cKO cochleas showed extra IHCs and an increase in innervation of the MS domain, which we predict is caused by increased JAG1, and disrupted morphology of cells in the lateral sensory domain, which we predict is caused by increased by increased Shroom1. In conclusion, Mybl2 is a novel developmental control gene that plays a transient, but critical role in establishing sensory boundaries and radial asymmetry in the cochlea.

1006. Low-Dose Arsenic Exposure Alters the Expression of Genes Associated with Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Exposure in Zebrafish Embryos

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Marissa Paine Meaghan Caron Emma Boudreaux Brendan Moline Keith Hutchison Benjamin King

Faculty Mentor: Benjamin King

Abstract: Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS), or "forever chemicals" in the Maine water system have become a critical problem in the state. These hazardous toxins are prevalent in our food, water, and natural resources-causing significant environmental and health concerns. Using the Comparative Toxicogenomics Database (CTD), we found that there are 5,941 and 4,903 genes that respond to PFAS and arsenic, respectively, with 1,547 genes in common. Arsenic is a known carcinogen, with chronic exposure to this chemical resulting in neuropathy, cirrhosis, and anemia. The current standard for arsenic in Maine drinking water is 10 ppb. Exposure to 2 and 10 ppb arsenic has been shown to reduce the innate immune function to the opportunistic pathogen, Pseudomonas aeruginosa, in a zebrafish model. We reanalyzed gene expression data from an RNA sequencing study of zebrafish embryos exposed to 0, 2, and 10 ppb arsenic which were then infected with P. aeruginosa. We found 68 genes were differentially expressed with 10 ppb arsenic exposure and with P. aeruginosa infection. Of these 68 genes, 17 genes had interactions with PFAS in CTD. Of these genes, six were a part of the steroid hormone biosynthesis pathway. This pathway has been identified as a target for endocrine-disrupting chemicals, suggesting that PFAS chemicals may negatively impact growth and development. One of the six genes, leukocyte cell derived chemotaxin 2, was downregulated with arsenic

exposure and has important functions in innate immunity. This work is significant in addressing PFAS contamination and potential health effects from exposure.

1007. The Mysterious Gordonia Phage Widow

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Wyatt Oglesby Ben Curtis Griffin Lawrence Jaylee Rice Emelia Tremblay Bayarjavkhlan Ganbaatar Melody Neely

Faculty Mentor: Melody Neely

Abstract: Antibiotic resistance in bacteria is expected to reach epidemic proportions by 2050. To combat this, bacteriophages, viruses that infect bacteria, are being studied as an alternative solution to antibiotics. With more knowledge of phages and their genes, otherwise incurable bacterial diseases may become curable. To increase knowledge about phages and their applications to medicine, novel Gordonia terrae phage, Widow, was isolated and annotated. Widow was isolated in Mattapoisett, MA using an enriched isolation process. It is a lytic cluster CD phage belonging to the Siphoviridae family, containing 63 genes, 43656 total base pairs, and GC content of 67.6%. The placement of the lysin B protein relative to the rest of the lysis cassette may be indicative of the work of a mobile gene element. This is a distinct feature of Widow as this does not follow the canonical genome structure. Further research may be conducted to explore how these phage may be applied in fields such as waste management and bacterial infections, as other G. terrae phage have been utilized in the past. Such research could also provide insight on how phages are able to hijack the bacterial host and cause lysis.

1008. Creating Efficient Anti-Bacterial Surfaces on Catheters with Antibiotic-Free Liquid Coatings

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Chun Ki Fong Marissa Andersen Caitlin Howell

Faculty Mentor: Caitlin Howell

Abstract: The use of antibiotics to treat infections is widely recognized as a risky long-term strategy, particularly for widespread complications such as catheter-associated urinary tract infections where the potential for the development of resistance is high. In this work, we use bio-inspired liquid coatings to create catheter surfaces that are protein-resistant and antibacterial without the use of antibiotics and use this as a tool to better understand the relationship between protein adhesion and bacterial adhesion on medically relevant surfaces. Through controlling different parameters in the fabrication of liquid coating, it was possible to control the level of whey protein adhesion to a catheter surface. Protein deposition levels were found to be achievable between 0 and 100% with an accuracy of approximately $\pm 10\%$ compared to uncoated controls. Test on bacterial adhesion on catheters with higher levels of protein resistance. The results demonstrate that liquid coatings can be a useful tool in untangling complex interactions in the colonization of abiotic surfaces by living organisms, and can be applied to the production of antibacterial catheters that do not rely on antibiotics.

1009. Triacsin C Inhibition of Acyl-CoA Synthetases Hinders Multiple Myeloma Cell Proliferation and Survival

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Connor Murphy Heather Fairfield Mariah Farrell Victoria DeMambro Calvin Vary Michaela Reagan

Faculty Mentor: Michaela Reagan

Abstract: Multiple myeloma (MM) is a disease of clonal expansion of malignant plasma cells and has a 5-year survival rate of 50%. Intriguingly, obesity correlates with increased incidence of MM and a poor treatment response, but how dysfunctional fatty acid (FA) metabolism contributes to MM is unknown. Therefore, there is a critical need to understand how FA metabolism contributes to support MM. Changes in FA metabolism have been shown to support cell proliferation, migration and drug resistance in other blood cancers and solid tumors. Thus, we hypothesized that FA metabolism is important to supporting MM proliferation or survival. We used the Cancer Dependency Map, a database of gene fitness in human cancer cell lines to identify that most of the long-chain acyl-CoA synthetase (ACSL) family members supported MM cell line fitness. Therefore, we hypothesized that the ACSL family supports MM cell survival or proliferation.

To test this hypothesis, we treated human cell lines with an inhibitor (Triacsin C, TriC) of four of the five human ACSLs (ACSL1, 3, 4 and 5). TriC decreased MM cell proliferation, increased apoptosis, increased the sub-G1 MM cell population, and decreased mitochondrial membrane potential in a dose-dependent manner. MM cells treated with TriC for 24 hours had significantly decreased basal, maximal and ATP-dependent respiration and spare capacity.

Taken together, our data suggest that ACSLs support MM cell proliferation, survival, respiration

and mitochondrial function. Future studies will use genetic methods to identify specific roles for ACSL members in MM disease progression.

1010. Deletion of Mycobacterial Flotillin Gene to Assess Changes in Virulence of *Mycobacterium chelonae*

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Claire Bourett Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: Non-tuberculosis mycobacteria are increasingly causing severe, opportunistic infections, especially in cystic fibrosis and other immunocompromised patients. Mycobacterium abscessus, one of the most drug-resistant species with only a 46% successful treatment rate, is commonly identified as the causative agent. Studying the mechanisms of multidrug resistance within mycobacteria will reveal new targets for potential treatments. The Molloy Lab recently showed that the presence of two prophages, integrated viral genomes, increases antibiotic resistance and the expression of an important antibiotic resistance transcriptional regulator in M. chelonae, a pathogenic mycobacteria closely related to M. abscessus. This strain also demonstrated a ~100-fold increase in expression of a bacterial flotillin gene relative to strains carrying only one or no prophage. To determine if the flotillin gene plays a role in the increased antibiotic resistance we proposed to delete the M. chelonae flotillin gene and compare antibiotic resistance and expression of resistance genes to wildtype strains. 1200-bp sequences that flank the flotillin gene were successfully cloned into a mycobacterial suicide vector, pKO. The vector will be used to delete the flotillin gene in the M. chelonae genome, through homologous recombination. To assess changes in antibiotic resistance, minimum inhibitory concentration assays (MICs) with amikacin will be performed on the deletion strain and compared to the wildtype strain. The effect of the flotillin deletion on expression of antibiotic resistance genes will be determined by qRT-PCR. If flotillin plays a role in the observed antibiotic resistance, flotillin inhibitors could be an attractive drug therapy for drug-resistant mycobacterial infections. **1011.** Designing a Functional Trunnion Prototype for Attachment of an Artificial Leg to a Femoral Implant to Be Used for Osseointegrated Prosthetics

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Emma Sperry David Neivandt

Faculty Mentor: David Neivandt

Abstract: High infection rates are a significant issue with regard to recovery after orthopedic surgeries involving transcutaneous implants. As a solution, highly porous metal implants have been tested and proven to promote bone and soft tissue ingrowth, including all tissues from the skin down to the bone, thereby creating a biological seal preventing infections arising from external entities. Among the many challenges limb amputees face are irritation and ingrown hairs arising from the fitment of a prosthetic with a socket mounted over the residual stump. The highly porous transcutaneous technology potentially offers a solution to this problem via providing a permanent mounting point that bridges the skin and soft tissues while being anchored in the bone. In order for osseointegrated implants to be a valid surgical treatment for prosthetic users, a functional mounting and pivoting device for attachment of an implant to a prosthetic device that includes a fail-safe mechanism must first be engineered. The present work employs finite element analysis (via SolidWorks) to model the forces required to shear bolts that would connect the prosthetic to an osseointegrated trunnion. Various materials and designs of the bolt are being modeled, including notches of various shapes intended to act as stress risers. Analyzing the modeled stress results at the notch in comparison with known torque and bending moment failure points, as well as average peak forces and moments during daily activities, is providing information necessary to optimize the design to enable daily activities but promote failure under conditions that would potentially lead to danger to the user.
1012. Microfluidic Chanel Applications to Improve a Pulsed-Electric Field Water Purification System

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Amelia Cobb Liza White Caitlin Howell

Faculty Mentor: Caitlin Howell

Abstract: Clean water accessibility is one of the most pressing issues in our modern society as it affects people worldwide and has devastating consequences if unavailable. Researchers at the Wyss Institute at Harvard University developed a pulsed electric field water purification system; however the device's power consumption is too high for its intended use as a portable system. The purpose of this research is to optimize the water purification system by reducing fabrication costs and overall power consumption. To do this, we have created a flow cell made of metal-coated polyethylene terephthalate (PET) which is spaced with heat activated adhesive and PET. We tested each individual flow cell by attaching the cell to a high voltage DC power supply. We used an oscilloscope to ensure the flow cells produced a square wave, demonstrating that electricity effectively flows through the system, and we used a digital voltmeter to ensure continuity throughout the metal coating. These results demonstrate that metal-coated PET can effectively conduct electricity which is needed for a pulse electric field water purification system.

Acknowledgements:

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1013. Synthesis and Decarboxylation of Eumelanoids

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Alexander Wilkins Matthew Brichacek

Faculty Mentor: Matthew Brichacek

Abstract: Parkinson's disease is a neurodegenerative disorder that affects dopamine-producing nerve cells in the brain. Patients with Parkinson's commonly have a lack of a pigment called neuromelanin, which a healthy individual would have an abundance of. Neuromelanin is found in portions of the brain, and is a mixed melanin composed of eumelanin and pheomelanin polymers. Synthetic neuromelanin analogs can be used to better understand this neurodegenerative disorder since obtaining the natural polymer is challenging. In this study, the syntheses of brominated eumelanoid-methyl esters were conducted. The halogen-free eumelanoid was synthesized and decarboxylated in 10% yield. The 4-bromo eumelanoid decarboxylation was attempted with copper powder, copper (II) chromite, and a copper salt catalyst. Future endeavors will identify alternative decarboxylation methods as well as use a Miyuara borylation and a Suzuki coupling to synthesize the neuromelanin product. The photophysical and biological properties of the new molecules will be assessed.

1014. AAV9-Ighmbp2 Gene Therapy Significantly Improves Motor Performance in Severe SMARD1-like Mouse Model, nmdem3, and CMT2S Mouse Model, nmdem5

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Sarah Holbrook Amy Hicks Paige Martin Greg Cox

Faculty Mentor: Greg Cox

Abstract: Autosomal recessive mutations in IGHMBP2, a ubiquitously expressed DNA/RNA helicase, have been linked to childhood neuromuscular degenerative diseases (NMDs). C57BL/6J-Ighmbp2em3Cx is a SMARD1-like strain, or Spinal Muscular Atrophy with Respiratory Distress, created via CRISPR-Cas9 targeting of the IGHMBP2 gene and hereafter referred to as em3. SMARD1 is characterized by muscle weakness starting in the distal extremities and diaphragmatic paralysis leading to respiratory failure. Most patients are diagnosed in early infancy and die in early childhood. The em3 mouse has more severe muscle atrophy than the historical SMARD1-like model (nmd2J) in the hind limb, diaphragm, and intercostal muscles. The em3 mouse model also has an average lifespan of ~3 weeks compared to the 2J's ~3 month lifespan. C57BL/6J-Ighmbp2em5Cx is a Charcot-Marie-Tooth disease type 2S model that does not impact lifespan but does impact motor and sensory function beginning around the 4 week timepoint. Gene therapy has shown promise in another NMD, Spinal Muscular Atrophy (SMA). In collaboration with the Meyer lab at Nationwide Children's Hospital in Columbus, OH, we are testing 2 different AAV9-Ighmbp2 vectors. Each has a different promoter expressing varying levels of IGHMBP2. We performed postnatal day 1 intracerebroventricular injections on em3 and em5 mutants to determine the efficacy of each treatment. Using a variety of assays to determine strength and neuromuscular degeneration, we determined that the P546 promoter is more effective in EM3 mutant mice and that either virus shows equal improvement the EM5 mutant mice.

1015. Cohabitating Prophage Interactions and their Role in Regulation of Important Mycobacterial Antibiotic Resistance Genes

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Matthew Cox Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: Mycobacterium abscessus causes pulmonary and soft tissue infection in cystic fibrosis patients, and is oftentimes multidrug resistant. Understanding the mechanisms of multidrug resistance is critical for developing alternative treatments. Prophage, viral genomes integrated into the host genome, increase antibiotic resistance in mycobacteria but the mechanism is not understood. Our lab demonstrated that pathogenic mycobacteria carrying two prophages, McProf and BPs, has increased antibiotic resistance and expression of antibiotic resistance gene whiB7 relative to strains carrying only one or no prophage. McProf is only capable of lysogeny while BPs is capable of prophage induction in which it excises from the bacterial genome and carries out lytic infection. It is unknown whether BPs lytic or lysogenic infection triggers increased antibiotic resistance. We hypothesize that BPs lytic infection activates McProf gene products that drive changes in antibiotic resistance. To determine which BPs lifecycle drives this process, we used RNAseq to discern the lytic gene expression profile of BPs in M. chelonae. whiB7 expression was measured in M. chelonae in the presence and absence of McProf during lytic BPs infection. whiB7 is upregulated in strains of M. chelonae carrying McProf while expression remains low in strains lacking McProf. A double lysogen of M. chelonae (BPs, McProf) that overexpresses the BPs immunity repressor has diminished induction events and low whiB7 expression relative to non-recombinant M. chelonae double lysogens. Taken together, these data show that prophage can sense and respond to bacterial stress such as phage lytic infection and increase survival during drug exposure.

1016. Determining the Role of Paratox in Streptococcus agalactiae: Virulence and Bacterial Fitness

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

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Faculty Mentor: Melody Neely

Abstract: Bacteriophages are viruses that infect bacteria. When introduced into the cell, they can insert their DNA into the host cell's genome and become prophages. Prophages have been found in Streptococcus agalactiae (Group B Streptococcus or GBS), a human pathogen that colonizes the vagnial tract of 25% of pregnant women, and can cause life threatening illnesses in infants such as sepsis or meningitis. Prophages often contribute to bacterial virulence and fitness, but it is currently not known what specifically in the prophages of GBS is causing virulence. A gene of interest, called Paratox, has been found in the majority of GBS prophages and has contributed to natural competence in other species of Streptococcus, however, we currently have no information on what Paratox is doing in GBS. The gene adjacent to Paratox and transcribed in the opposite direction encodes a protein called the Holin-like toxin. In this proposal, we will be looking at the conditions in which Paratox and the Holin-like are expressed to determine when they are active in the cell. In addition, we will determine what effect these phage-encoded proteins have on bacterial fitness and if they contribute to GBS virulence. The results from this study will provide new information on how a prophage gene can contribute to overall virulence and bacterial survival.

1017. JC Polyomavirus Infection is Reduced by Repurposed Therapeutics

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Avery Bond Mason Crocker Michael Wilczek Nicholas Leclerc Melissa Maginnis

Faculty Mentor: Melissa Maginnis

Abstract: JC polyomavirus (JCPyV) infects up to 80% of the human population, with healthy individuals developing a persistent, asymptomatic infection in the kidneys. In severe cases of immunosuppression, JCPyV can spread from the kidneys to the brain and cause a lytic infection of glial cells, resulting in the disease progressive multifocal leukoencephalopathy (PML). Progression of PML leads to extreme cognitive dysfunction and debilitation and is ultimately fatal. Because there are no approved treatments for this disease, continued research on JCPyV and PML is crucial. In an effort to identify potential therapeutics for PML, the Maginnis laboratory performed a large-scale drug screen using the National Institutes of Health Clinical Collection (NIH-CC). Glial cells were treated with drugs and small molecule inhibitors, infected with JCPyV, and viral infectivity was assayed via high-throughput In-Cell Western assays. Results demonstrated that multiple FDA-approved drugs from various drug classes reduced JCPyV infection. Drug categories with the largest number of "hits" include receptor agonists/antagonists, calcium signaling-related drugs, and enzyme inhibitors. Further characterization of calcium channel blockers and calmodulin inhibitors through viral infectivity assays supports a role for calcium signaling during JCPyV infection. Potential antivirals for JCPyV infection and PML will be identified through additional detailed characterization of hits. Repurposing existing treatments is an effective method for discovery of antiviral therapies, and thus exploring pre-approved drugs from the NIH-CC is a promising route for identifying treatments for PML.

1018. Interactions Between Co-habitating Prophages Increases Expression of Mycobacterial Intrinsic Resistance Gene, whiB7

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Sarah McCallister Matthew Cox Jaycee Cushman Keith Hutchison Joshua B Kelley Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: Prophage, integrated viral genomes, are known to increase antibiotic resistance of bacterial pathogens. Non-tuberculosis mycobacteria such as Mycobacterium abscessus, causes pulmonary and disseminating infections that are often totally drug resistant. Most M. abscessus isolates carry one or more prophages but their role in intrinsic antibiotic resistance is not yet known. We have demonstrated that M. chelonae, a close relative of M. abscessus, has higher antibiotic resistance and expression of a conserved mycobacterial regulator of antibiotic resistance genes, whiB7, increases in the presence of two prophage genomes. The first prophage, McProf, only carries out lysogenic infection of M. chelonae. The second prophage, BPs, is capable of lysogenic infection but also undergoes induction and lytic infection. We hypothesize that BPs induction activates McProf gene products, such as polymorphic toxin systems, to increase expression of whiB7. We have demonstrated that strictly lytic infections by BPs increases whiB7 expression in the presence of McProf. Inhibiting BPs induction in the M. chelonae double lysogen (BPs, McProf) decreases whiB7 expression. We don't know whether whiB7 expression increases in the BPs induced cells or through signaling in neighboring lysogenic cells. To determine if BPs induction increases whiB7 expression in cis or in trans we have constructed M. chelonae strains with an mCherry-whiB7 promoter reporter and a BPs-GFP fluorophage that reports lytic gene expression. Using fluorescent microscopy we will monitor BPs induction events and whiB7 expression in double lysogen strains of M. chelonae (BPs,

McProf) and in a super M. chelonae lysogen (BPs, McProf) (pMHBPsgp33) strain that has diminished induction events.

1019. Nanoparticles as Local Reporters in Biological Systems: Modeling Signal and Understanding Limitations

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Jeremy Grant Aimee Co Michael Mason

Faculty Mentor: Michael Mason

Abstract: As early as 2001, advances in engineered nanotechnologies have caused great excitement about the possibility of using SERS-active nanoparticles as inert, non-toxic, non-bleaching alternatives to fluorescent molecules and quantum dots. Now, nearly 20 years later, there exist few practical examples of the use of SERS-active nanoprobes, despite significant levels of funding and many related publications. These previous works failed because they ubiquitously assumed near-optimal behavior in several key probe factors including Raman cross-section (enhancement), nanoparticle surface loading (number of probe species present), and available nanoparticle concentration (number of particles), all of which are attributable to working in a complex, highly non-ideal biological environment. Here we present a simple scalable accounting model which makes it possible to understand the signal limitations apparent in previous attempts at imaging these probes in biology and allows for determination of likely signal limitations, a key consideration for planning future Raman based imaging experiments.

1020. No More Excu-SES: It's Time to Address Class and Cognitive Function

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Zoe Prats Angel Boeve Lily Brown Madison Landry Rebecca MacAulay

Faculty Mentor: Rebecca MacAulay

Abstract: Objective: Lower socioeconomic status (SES) is associated with several negative health outcomes. Although SES encapsulates both material resources (i.e. income and education) and prestige-related characteristics (i.e. subjective social status (SSS)), most brain health studies focus on the former, leading to inconclusive findings in the literature. Previous research suggests that SSS has incremental validity in predicting cognitive outcomes; SSS is therefore a potentially modifiable risk factor for cognitive decline that requires further exploration. Using data from the Maine Aging Behavior & Learning Enrichment (M-ABLE) study, we aimed to determine whether SSS moderates the relationship between income and executive function (EF). Method: Comprehensive neuropsychological testing and clinical interview were used to assess 124 older adults with a mean age of 71 years. PROCESS regression was used to evaluate the proposed moderation models, with age and education as covariates. Results: Correlational analyses found that income and education were positively associated with EF. No significant relationship was observed between SSS and EF. PROCESS regression indicates that SSS does not moderate the relationship between income and EF. Conclusions: While SSS was strongly associated with objective SES, it was not associated with EF. This suggests that reporting bias or a third variable (e.g. self esteem) may account for the additional variance explained by SSS for health above and beyond that of objective SES. Further research is required to understand what factors individuals use to rate their SSS, as this would provide insight into why SSS shows incremental validity with respect to health outcomes.

1021. Overrepresentation of Kidney Development Function Among 937 Genes Associated with Chronic Kidney Disease in 21 Genome-Wide Association Studies Across Multiple Patient Populations.

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Omodasola Adekeye

Benjamin King

Faculty Mentor: Benjamin King

Abstract: Chronic Kidney Disease (CKD) is a global public health burden with high morbidity and mortality rates. There is a high prevalence and incidence of CKD across the globe. 37 million adults in the United States are estimated to have CKD, which makes up approximately 15% of the adult population. The disease presents no symptoms until it progresses to its end-stage, rendering affected patients uninformed of their condition early enough. CKD is a complex disease influenced by genetic and environmental factors. Genome-wide association studies (GWAS) have been used to associate genetic variants (SNPs) with CKD in different populations. We hypothesize that the CKD-associated genes will map to common biological processes that may increase the risk of developing CKD when dysregulated. We compiled the SNPs from 21 GWAS studies and mapped them to genes using Ensembl's BioMart tool. A total of 1,606 unique SNPs and 937 genes were identified from the studies. The overlapping SNPs and genes from the studies were calculated and visualized using the R/upset package. Gene Ontology (GO) Biological Processes (BP) annotations for the gene sets were reported and analyzed using the DAVID database. A total of 784 GO BP terms were overrepresented among the genes. One of the overrepresented BP terms was kidney development and function, which was commonly annotated to 30 of the 937 genes. Our research provides a comprehensive set of sequence variants and genes that have been associated with kidney function and will help inform future studies of CKD among different populations.

1022. Investigating Disruptions in Axon Guidance in Dystroglycanopathy.

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Kodey Silknitter Benjamin King Clarissa Henry

Faculty Mentor: Clarissa Henry

Abstract: Protein glycosylation has emerged as a critical function to facilitate axon guidance and the importance of how this function modulates axon guidance in muscular dystrophies is rapidly emerging. The dystroglycan complex is a glycosylated, transmembrane receptor that binds to extracellular proteins and is critical for extracellular matrix protein-myofiber interaction. Dystroglycanopathy is a form of muscular dystrophy in which 1 of the 18 proteins responsible for glycosylating dystroglycan is non-functional. If one of these genes develops a mutation resulting in a disrupted protein, dystroglycanopathy is the result. Patients diagnosed with dystroglycanopathies can experience muscle wasting, developmental delay, and a shortened lifespan. Recent studies have found that when dystroglycan is knocked-out, axon guidance and subsequent muscle innervation are disrupted. Clearly, dystroglycanopathies compromise the function of the neuromuscular system but the role of the dystroglycan glycosylation proteins axon guidance proteins is not well understood. Our preliminary data suggest that primary motor neuron axon guidance and subsequent neuromuscular junction formation is disrupted in multiple forms of dystroglycanopathy. We have generated two, novel, dystroglycanopathy zebrafish models that arise from a mutation in either gmppb or b4gat1, both of which are responsible for dystroglycan glycosylation. Our current hypothesis is that gmppb and b4gat are both required for proper axon guidance. The two zebrafish models display axon guidance disruption that have not previously been reported. Additionally, RNA-seq data indicates that genes associated with axon guidance are significantly down-regulated in gmppb-/- zebrafish. Ultimately, this work will contribute to our understanding of axon guidance and the disease model.

1023. Investigating the Impact of Prophages on Bacterial Fitness of Streptococcus Agalactiae

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Caitlin Wiafe-Kwakye Sally Molloy Melody Neely

Faculty Mentor: Melody Neely

Abstract: Most pathogenic bacteria carry prophages, genome integrated bacterial viruses, that encode genes that improve pathogen fitness and virulence resulting in increased dissemination and infection. Streptococcus agalactiae, a commensal pathogen, often harbors one or more prophages, but their significance in pathogen fitness and virulence is unknown. S. agalactiae is the frequent cause of life-threatening infections in neonates and young infants. However, antibiotic treatment can have long-term negative effects on the microbiota of neonates. By understanding the role of prophages in S. agalactiae virulence, we provide new opportunities to develop alternative treatments. CNCTC 10/84 is a hypervirulent neonatal blood isolate carrying a single prophage within the bacterial genome. To understand the prophage contribution to bacterial fitness, we cured CNCTC 10/84 of its prophage (phage-cured) to compare gene expression and fitness with that of the wildtype strain. To examine differences in virulence we used a zebrafish larval model. Co-infection with both strains simultaneously resulted in the wildtype strain having a competitive advantage over the phage-cured strain, demonstrating a phage-encoded advantage. Additionally, whole-genome transcriptome analysis was performed on the wildtype and phage-cured strains to determine if bacterial gene expression is altered by the prophage. The gene expression analysis indicates that loss of the prophage significantly altered expression of 27.3% of S. agalactiae genes. These results provide insight into the role that prophages play in the disease pathogenesis of S. agalactiae and ultimately may lead to the identification of potential targets for alternative therapeutic approaches.

1024. Differential Expression of Interferon Response Genes in the Innate Immune Response to Influenza A Virus Infection

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Julianna Grampone Brandy-Lee Soos Benjamin L. King

Faculty Mentor: Benjamin L. King

Abstract: An estimated 650,000 deaths occur per year from respiratory diseases associated with seasonal influenza virus infections. Influenza A Virus (IAV) is one of four types of influenza viruses and changes in the viral genome through antigenic drift and shift pose a significant threat to global health. The objective of our study is to understand innate immune response to IAV by comparing differentially expressed interferon response genes (IRGs) using a larval zebrafish model of IAV infection. Zebrafish larvae are an excellent model for the innate immune system as it is functional by 24-48 hours post fertilization and the adaptive immune system does not develop until 2-4 weeks later. The innate immune response to virus infection includes the interferon pathway. Interferons are proteins secreted by an infected cell that signal to nearby cells to resist further infection. Interferons can induce the expression of IRGs that mediate the antiviral response. A previous genetic screen evaluated whether 380 IRGs impacted IAV entry and replication in human cells. We mapped the human IRGs to zebrafish homologs using Ensembl. We assayed the expression of candidate zebrafish IRGs using qPCR in embryos at 6 and 12 hours post infection. One of these genes, interleukin 1 beta (illb), has important roles in inflammation. Future directions of our research include assaying the expression of additional candidate IRGs to expand our knowledge of interferon signaling following IAV infection.

1025. Determining the Role of Prophage McProf Gene Products in *Mycobacterium chelonae* Antibiotic Resistance

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Hector Orellana Sarah McCallister Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: Mycobacteria presents a huge impact on human health, due to the difficulty in treating drug resistant mycobacterial infections. Mycobacterium abscessus causes pulmonary infections in Cystic Fibrosis patients and is one of the most intrinsically antibiotic resistant bacteria, with a successful treatment rate of only 45%. If we want to improve treatment of these drug resistant pathogens, it will be important to understand the mechanisms of mycobacterial drug resistance. The long-range goal of this project is to understand how genes encoded by viruses that reside in the bacterial genome, called prophage, contribute to mycobacterial drug resistance. The Molloy lab showed that the presence of two prophages McProf and BPs increase antibiotic resistance of the pathogen *M. chelonae*. We hypothesize that induction of the BPs prophage, interacts with McProf gene products to drive changes in antibiotic resistance. To determine which McProf gene products to antibiotic resistance, we have cloned each of the genes expressed from the McProf genome in the bacterium. Recombinant strains for each of these genes are being tested relative to control strains for changes in antibiotic resistance by minimum inhibitory concentration assays.

1026. The Danger of Prophage and its Effect on the Virulence of Streptococcus Agalactiae

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Caiden Fraser Caitlin Wiafe-Kwakye Melody Neely

Faculty Mentor: Melody Neely

Abstract: Naturally occurring prophages were found in 85% of pregnant female reproductive tract isolates of Streptococcus agalactiae (Group B Strep, GBS), which can lead to increased virulence and disease pathogenesis to the neonate, resulting in more difficult treatments and increased mortality. Antibiotics are the only known treatment for GBS, however GBS is becoming increasingly resistant to these antibiotics. Therefore, to find new ways to treat GBS infections, we need to know more about the various prophages carried by these isolates and the proteins they encode. The prophage were analyzed using bioinformatic applications to see if they possessed any genes that were known to be associated with an increased disease pathogenesis and/or increased bacterial fitness. This was done through the process of genome assembly and annotation. Genomes were first sequenced and assembled, then online tools and databases were used to identify the location of genes, and the function of the proteins they encode. PhiDMC64 is one of the isolated prophages being researched. PhiDMC64 was found to contain 68 genes and multiple Toxins, including a Holin like Toxin, Paradox, and a Ntox50. These toxins and toxin antitoxin systems are known to increase virulence due to their ability to degrade foreign substances and protect the cell. It has been found that multiple other prophages isolated from GBS contain these same genes. These genes give a potential target for future research, to help in the fight against GBS.

1027. DMC9 Prophage Characterization and Impact on Group B Streptococcus Virulence

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Katie Southworth Hannah Maurais Caitlin Wiafe-Kwakye Melody Neely

Faculty Mentor: Melody Neely

Abstract: Group B Streptococcus (GBS) is a commensal bacteria that colonizes the vaginal tract of many pregnant women but is an opportunistic pathogen in immunocompromised individuals, which include fetuses and neonates. Colonization of the vaginal tract during pregnancy puts the baby at risk of infection in utero and during labor. To combat this, women colonized with GBS are given high doses of antibiotics during delivery, but that can harm the natural flora and immune systems of both the mother and baby. While not well-analyzed, GBS is known to carry prophages, which are bacterial viruses that insert themselves into the GBS genome and often carry virulence factors. Clinical isolates of GBS were obtained from the vaginal tracts of pregnant women (DMC strains) and found to obtain prophages. phiDMC9 is a cluster C serotype III prophage within DMC9 that likely influences the fitness and virulence of the pathogen, through genes such as paratox that may aid in defense against competing organisms by inhibiting the uptake of new DNA molecules. The phiDMC9 genome is 39,148 base pairs long and carries 55 genes. Its effects will be investigated by comparing the wildtype to a strain that is cured of the prophage in order to observe changes in the resulting bacterial infections in zebrafish. Additionally, a live-dead assay of the two strains will show its influence on bacterial cell membrane integrity. Characterization of phiDMC9 can lead to better knowledge of GBS, as well as improvements in current treatments for the disease.

1028. Continuous Monitoring of Contamination on Surfaces via Structural Color Analysis

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Oisin Biswas Caitlin Howell

Faculty Mentor: Caitlin Howell

Abstract: The automated detection of microbes on surfaces is critical to understanding and maintaining a healthy balance of beneficial microorganisms while reducing or eliminating harmful ones. However, such detection can be extremely challenging in environments where continuous monitoring is difficult, such as surfaces in and around plant growth areas aboard the International Space Station (ISS). Current monitoring methods of surfaces aboard the ISS are both lengthy, expensive, and diminishes valuable time of astronauts. The work in this project took advantage of the optical phenomenon of structural color to develop a rapid, low-cost, and contactless method of surface contamination detection. To accomplish this, a mass-produced material imprinted with a nanostructured pattern capable of exhibiting this structural color phenomenon was used. The diffraction patterns of this material creating these structural color effects were studied, where manual analytical techniques were developed to show quantitative differences in these effects when a faux surface contaminant ---- silicone oil --- was present. The developed techniques focused on three main features of interest in the diffraction patterns: light intensity, diffraction pattern length, and color presence. Light intensity was found to be the greatest indicator of surface contamination presence. Yet, with all three techniques, it was possible to detect the silicone oil contaminant down to at least a volume of 1 x 10-1 μ L/ 64 cm2. This work lays the foundation for the development of a rapid, low-cost, and contactless method of contamination detection applicable to plant growth areas with the goal of keeping astronauts in space safe.

1029. Characterization of a Group B Streptococcus Prophage

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Robin Southwick Caitlin Waife-Kwakye Melody Neely

Faculty Mentor: Melody Neely

Abstract: Group B Streptococcus (GBS) inhabits the gastrointestinal and urogenital tracts of 35% of the healthy population. Gram-positive bacteria represent a leading cause of invasive bacterial infections in newborns. pathogens carry prophages, genome integrated bacterial viruses. Studying prophage-carrying bacteria gives us a better understanding of how bacteria become pathogenic and can save lives and cure diseases. Prophages often encode toxin genes and provide resistances that can make some bacteria more pathogenic and infectious. The goal of this research is to determine how prophages of Streptococcus contribute to bacterial pathogenesis or regulation of host gene expression. DMC69 a vaginal isolate from anonymous pregnant female. The genome was sequenced and the prophage phiDMC69 were extracted using the program Phaster. Genome annotation is done by collecting information such as possible links between similar genes and possible gene functions using gene databases, HHpred, NCBI, BLAST, Topcons, and PECAAN. From the annotation, we learned that phiDMC69 belongs to cluster C phages, has a 36.2% GC content with a total 65 genes. The genome contains a single orpham, a gene with no known homologs. phiDMC69 contains proteins like holin-like toxin and paratox, both of which increase bacterial fitness. By studying and annotating the genes of integrated prophage we can uncover how, why, and perhaps even when, new genetic information caused ordinary benign bacteria to become pathogenic.

1030. MicroRNA Regulation of Neutrophil Inflammation Regulation during Influenza A Virus Infection

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Riley Grindle Brandy-Lee Soos Benjamin King

Faculty Mentor: Benjamin King

Abstract: Influenza virus infection causes a substantial inflammatory response by the innate immune system. Neutrophils play a major role in innate immunity where they migrate to the site of infection, clear infection, and then migrate away. Hyperinflammatory responses due to neutrophil overactivation can result in tissue damage. Thus, neutrophil activity must be carefully balanced to reduce tissue damage while still clearing the infection. MicroRNAs (miRNAs) are potent regulators of genes and we hypothesize that miRNAs function to regulate neutrophil function during Influenza A Virus (IAV) infection. Using a zebrafish model of IAV infection, we have been studying to determine when and how neutrophils are being activated. We have measured the expression of a set of candidate miRNAs previously identified to be involved with neutrophil regulation during bacterial infection. Specifically, we have been studying miR-199, miR-722, and miR-146a. Both miR-199 and miR-722 have been described to have roles in neutrophil migration in response to bacterial infection. MiR-146a has been described to regulate Toll-like receptor signaling during bacterial infection. Additionally, we will assay miRNA expression in IAV-infected zebrafish after knocking down two genes with important roles in neutrophil function, ncf1 and cxcl8b. Ongoing preliminary studies in our laboratory have shown that knocking down these genes alters survival of zebrafish embryos following IAV infection. Preliminary results show that there was a significant change in the candidate miRNA expression following IAV infection. Our studies aim to uncover the role of miRNAs in regulating neutrophil function and the overall response to IAV infection.

1031. Characterization of the Cluster MabR Prophages of *Mycobacterium abscessus* and *Mycobacterium chelonae*

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Jacob Cote Colin Welch Madeline Kimble Dakota Archambault John Curtis Ross Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: *Mycobacterium abscessus* is one of the most drug-resistant bacteria we know of and is a significant pathogen in cystic fibrosis and immunocompromised patients with low treatment success rates. The majority of clinical *M. abscessus* isolates carry one or more prophages that are hypothesized to contribute to virulence and bacterial fitness. The prophage McProf was identified in the genome of the Bergey strain of *M. chelonae* and is distinct from previously described prophages of *M. abscessus*. The McProf genome increases intrinsic antibiotic resistance of *M. chelonae* and drives expression of the intrinsic antibiotic resistance gene, whiB7, when superinfected by a second phage. The prevalence of McProf-like genomes in sequenced mycobacterial genomes was bioinformatically determined. Related prophage genomes were identified in 25 clinical isolates of *M. abscessus* and assigned to the novel cluster, MabR. The MabR genomes share less than 10% gene content with previously described prophages; however, they share features typical of *M. abscessus* prophages, including polymorphic toxin immunity (PT-Imm) systems, which we hypothesize could be involved in the observed antibiotic resistance increases in our model.

1032. Regulation of Microtubule Dynamics During the Pheromone Response in Saccharomyces Cerevisiae

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Loren Genrich Joshua Kelley Cory Johnson

Faculty Mentor: Joshua Kelley

Abstract: The budding yeast, Saccharomyces cerevisiae, responds to pheromone through a G-protein coupled receptor (GPCR) signaling pathway. Upon receptor activation, the heterotrimeric G-protein dissociates and initializes separate downstream signals through the Ga and GBy subunits. When responding to pheromone, cells either elongate towards the source of pheromone or form mating projections known as "shmoos." The kinesin Kar3 is located at the tip of the shmoo and regulates plus-end polymerization of microtubules via interaction with Ga, which has been shown to negatively regulate microtubule assembly. We used a hyperactive $G\alpha$ mutant that possesses a single amino acid mutation at position 302, where the glycine (G) is converted to a serine (S). This renders the $G\alpha$ unable to bind to the regulator of G-protein signaling (RGS), which prevents RGS-induced acceleration of the intrinsic GTPase activity of Ga, the primary negative regulator of G-protein signaling. During pheromone-induced elongation, the nucleus aligns along the axis of polarity (toward the leading edge of the mating projection). This nuclear positioning is dependent on Gpa1 regulation of Kar3. Our preliminary data shows that nuclear orientation during gradient tracking in cells containing the hyperactive Ga varies considerably over time, compared to wild-type. Therefore we hypothesized that microtubule dynamics contribute to normal gradient tracking through a Ga-dependent mechanism during the yeast pheromone response. Using live cell microscopy, microfluidics, and image analysis, I will test the hypothesis that Ga control of Kar3 is important for polarized growth.

1033. VO2 Max Testing

Submission Type: Exhibit

Submission Category: Biomedical Sciences

Author(s):

Evan Bess Cole Perry Thomas Bowie Oliviah Damboise Michael Mason

Faculty Mentor: Michael Mason

Abstract: VO2 max testing is used to provide feedback on overall cardiorespiratory fitness by measuring the maximum rate oxygen is used during intense activity; however current testing equipment is limited by long tubes, uncomfortable masks, difficult cleaning procedures, cumbersome software, and expensive equipment. The goal of the project is to redesign the VO2 max testing system by eliminating tubing, modularizing the design, using more affordable sensors, and reducing the weight. The new testing system was fabricated by 3D printing components, Arduino boards, microphone, oxygen sensors, and gas flow meter which is controlled by LabVIEW 2019 software package. The microphone was used to acquire audio data that provided the frequency of breathing. The oxygen sensors were used in conjunction with an Arduino and LabVIEW virtual instrument (VI) to gather oxygen concentration data. The gas flow meter was used to monitor respiratory flow rate through a LabVIEW VI. Based on the results, this novel approach shows the potential to address existing VO2 max testing problems by reducing the complexity of the design, reducing the cost to the consumer, and eliminating the long tubing and uncomfortable masks.

1034. Evaluating Ca2+ Related Drugs for Inhibition of JC Polyomavirus Infection

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Amanda Sandberg Avery Bond Melissa Maginnis

Faculty Mentor: Melissa Maginnis

Abstract: Progressive multifocal leukoencephalopathy (PML), caused by JC polyomavirus (JCPyV) infection in glial cells, is a rapid, deteriorating, and fatal brain disease with no known cure. Approximately 80% of the world's population is infected with JCPyV, and for most the infection remains a persistent asymptomatic infection of the kidneys, but for individuals with suppressed immune systems the infection can migrate to the central nervous system and cause PML. Prior research has found that drugs modulating the intracellular flux of calcium (Ca2+) can reduce JCPyV infection, thus suggesting that Ca2+ signaling can be an important factor in driving a successful JCPyV infection in host cells. The goal of this project is to evaluate the inhibitory effect of tetrandrine, a nicotinic acid dinucleotide phosphate (NAADP) -sensitive two-pore Ca2+ channel drug, on JCPyV infection. Glial cells were treated with tetrandrine at concentrations ranging from of 2 to 7 μ M and infected with JCPyV. Infectivity was measured using an epifluorescence microscopy-based viral infectivity assay. Preliminary research suggests a decrease in JCPyV infection when cells are pre-treated with tetrandrine. The lack of effective treatments for PML highlights a crucial need for new anti-viral therapies. Evaluating calcium-related inhibitors and drugs, such as tetrandrine, for reduction of JCPyV infection contributes to the critical need for discovery of new therapeutic targets for PML.

1035. Quantifying Birefringence Images of Zebrafish Using a Mix of Deep Neural Networks and Image Analysis Tools

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Ahmed Almaghasilah Clarissa Henry Joshua Kelley

Faculty Mentor: Clarissa Henry

Abstract: In Henry's lab at University of Maine, we study muscular dystrophies such as Duchenne Muscular Dystrophy, a genetic disorder that results in progressive weakening and loss of muscle fibers and can lead to early death in children. We use birefringence, a non-invasive, live-imaging technique that uses polarized light to visualize muscle fibers of zebrafish. This technique allows us to assess the effectiveness of several therapies, which attempt to improve the functionality and structure of muscle fibers, applied on zebrafish with muscular dystrophies. The birefringence images are quantified by highlighting the zebrafish first and then calculating the mean gray value. However, the experiments typically generate a huge volume of images and quantifying these images manually can be an extremely time-consuming process. Analyzing data manually is also subjective and can result in variation, which can lead to the wrong conclusion. In addition, to the best of our knowledge, no one has ever developed a software nor an algorithm to automate the quantification of birefringence images. In the past, we trained a convolutional neural network (CNN) to automate the process but CNN did not yield reliable and high accuracy outcomes. For those reasons, we decided to apply image analysis techniques such as background contrast and several built-in functions on MATLAB while keeping the CNN predictions to enhance the final results. This novel approach has delivered better results than using CNN alone. The developed algorithm is able to discard noises that are usually mislabeled as zebrafish by the CNN and thus increasing the accuracy of the mean gray value. We believe our method will one day be the new standard in evaluating and quantifying birefringence images in the field of biomedical research.

1036. Role of the HU177 Cryptic Collagen Epitope in Differentially Controlling Breast Tumor Cell Behavior

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Jordan Miner

Peter Brooks

Faculty Mentor: Peter Brooks

Abstract: The growth and metastatic spread of malignant tumors is controlled by the stromal microenvironment and the extracellular matrix (ECM). However, it is challenging to develop clinically relevant strategies to disrupt the pro-tumorigenic mechanisms controlled by the ECM. Therefore, it is important to understand how stromal cells and structural changes within the ECM function cooperatively to facilitate the creation of a tumor permissive and immunosuppressive microenvironment that regulates tumor progression. The Brooks Lab has identified a unique cryptic collagen epitope (HU177). Phase-1 human clinical trials evaluating the anti-tumor activity of targeting the HU177 epitope have shown encouraging results. Therefore, there is a need to understand the mechanisms that contribute to this activity. During tumor growth, matrix metalloproteinases (MMPs) secreted by tumor and endothelial cells remodel and denature collagen in the ECM which leads to exposure of the cryptic sites. These sites play a role in tumor cell adhesion, migration, and proliferation and can be bound by the anti-HU177 antibody. 4T1 cells are a triple-negative tumor-derived cell line and are a model for human breast cancer. It was found that the humanized version of the HU177 antibody (D93) was able to specifically bind to denatured collagen I and IV and negatively impact cell adhesion for both collagen types. Interestingly, we found that 4T1 cells actually secrete denatured collagen themselves. Ultimately, D93 was shown to regulate 4T1 cell behavior through denatured collagen I and IV, aiding in the explanation of its anti-tumor activity.

1037. Testing Effects of Newly Isolated Prophage on Mycobacterial Drug Resistance

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Andre Daigle Katelyn Amero Eleanor Carrolton Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: Mycobacterium abscessus is the most isolated pathogen from cystic fibrosis patients and is often completely resistant to antibiotics, with only a 45.6% successful treatment rate (1). Incidence and deaths from non-tuberculous mycobacterial (NTM) diseases have been steadily increasing globally, both in immunocompromised and healthy individuals (2). Understanding the resistance mechanisms of NTM to antimicrobial drugs will be important for improving treatments of bacterial infections. Bacteriophages, through a temperate lifecycle, can integrate into bacterial genomes as a prophage to increase pathogen virulence. The Molloy lab has demonstrated that two types of prophage contribute to intrinsic resistance in M. chelonae, a pathogen closely related to M. abscessus. Currently, we only have two phage isolates that infect M. chelonae, limiting our understanding of their impact on drug resistance. To broaden this knowledge, we isolated two novel temperate phages from the soil, Aegeus and Baudelaire, on the host M. chelonae. The Baudelaire genome was sequenced and is 74,913 nucleotides in length and encodes 126 genes. Baudelaire is most closely related to cluster L phages isolated on non-pathogenic *M. smegmatis* but is unique among cluster L phages and was assigned to a novel subcluster, L5. Although Baudelaire is related to *M. smegmatis* phages, it is unable to infect *M.* smegmatis and its genome is enriched in toxin systems that are more typical in M. abscessus prophages. To study the effect of Aegeus and Baudelaire on mycobacterial drug resistance, the isolated M. chelonae lysogens will be compared to non-lysogen strains for antibiotic susceptibility.

1038. The Impact of Calmodulin Signaling on JC Polyomavirus Infection

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Aiden Pike Michael Wilczek Melissa Maginnis

Faculty Mentor: Melissa Maginnis

Abstract: JC polyomavirus (JCPyV) infects up to 80% of the population. In healthy individuals, JCPyV establishes a persistent, asymptomatic kidney infection. In immunocompromised individuals, JCPyV traffics to the brain and causes progressive multifocal leukoencephalopathy (PML). This fatal, demyelinating disease is characterized by the destruction of glial cells, development of white matter lesions, and the loss of vision, speech, and motor function. The mechanisms by which JCPyV causes PML remain poorly understood, and there is no approved cure, yet defining infection-regulating host factors can identify new treatment targets. Preliminary data from the Maginnis Laboratory suggests that JCPyV infection modulates calcium (Ca2+) and calmodulin signaling pathways, and altering these pathways reduces infection. The goal of this project is to determine whether calmodulin-dependent protein kinases (CaMKs) regulate JCPyV infection. CaMKs are activated upon intracellular Ca2+ release and implicated in gene expression regulation by stimulating transcription factors. CaMKIV is present in higher concentrations in brain tissue and translocates into the nucleus, stimulating transcription factor NF-kB. Interestingly, JCPyV possesses NF-kB-binding sites in the non-coding control region (NCCR) of the viral genome, which undergoes frequent recombination during viral pathogenesis. Transcriptomic data from JCPyV-infected cells suggests that CaMKIV is differentially expressed throughout infection. Current studies seek to define whether reduction of cellular CAMKIV impacts JCPyV infection and how CaMKIV affects nuclear NF-kB localization during infection. Understanding the impact of Ca2+ signaling on gene expression during JCPyV infection will improve our understanding of virus-host cell interactions and potentially lead to novel treatment targets.

1039. Aging and Connectivity in Dendritic Spines

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Marissa Ruzga Erik Bloss

Faculty Mentor: Erik Bloss

Abstract: Neurons have structural and functional characteristics that vary across the brain (Ottersen, O., Helm, P., 2002). This project focuses on comparing how different neurons respond to aging in terms of baseline phenotypic characteristics, including the density of dendritic spine synapses. We performed this analysis across two distinct sets of neurons: those that originate in the cortex and project to the thalamus and those that project to the amygdala. On each neuron, dendritic spines are small structures on the postsynaptic dendrites that represent the site of excitatory synapses. It has been shown that spine densities and average spine shape may change with age and may have correlation with performance on learning tests (Dumitriu, Hao et al., 2010).

Retrograde viruses were injected into either the amygdala or the thalamus of young or aged mice. Only the cortex data will be presented here. After the tissue was fixed and captured with confocal fluorescence imaging, the spine densities and diameters were recorded using computer reconstruction programs.

In the group of neurons that projected to the amygdala, aged animals were found to have a significantly lower density of spines and significantly smaller spine head diameters in one region. In contrast, those that projected to the thalamus showed no significant differences in spine density with age. Future work will examine projections in the hippocampus, as well as expand the scope with further investigation into the potential changes in spine size in respective regions.

1040. Spatial Frequency Domain Imaging Applications in Diabetic Testing

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Christian Crane Chisom Orakwue Anna Baldwin Karissa Tilbury

Faculty Mentor: Karissa Tilbury

Abstract: Diabetic neuropathy, vascular disease, and diabetic foot ulcers are key disease states of long term mismanaged or poorly controlled diabetes often impacting extremities such as fingers or feet. Neuropathy is one of the most common complications involving roughly 50% of diabetic patients over their lifetime. Following neuropathy, ulcers may form on the base of the feet degrading nearby tissue causing approximately 28% of ulcers to result in some form of lower extremity amputation. These conditions are often tested clinically by examination of sensation in the foot, localized perfusion pressure, transcutaneous oxygen pressure, dorsal foot pulses, and ankle or toe blood pressure metrics. Many of these widely accepted tests are often invasive, expensive, or incur risks such as X-ray and CT radiation. Through the use of spatial frequency domain imaging, data may be collected non-invasively to better understand physiologic conditions including regional oxygenation. Healthy, diabetic, and neuropathy volunteers were tested in three different loading conditions to better understand how pressure impacts physiology on the base of the foot. There has been limited research on quantifying pressure induced vasodilation in diabetics over a large field of view which we hope to elucidate. From initial data collection, the ability to see potential perfusion changes in the base of the foot is confirmed. Further research is needed and will be continued in the Tilbury biomedical engineering optics lab to understand the potential application of SFDI for diabetic testing.

1041. Effect of Pharmaceutical Agent Cetylpyridinium Chloride on Early Tyrosine Phosphorylation Events in Immune Mast Cells

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Marissa Paine Bright Obeng Lucas Bennett Patrick Fleming Julie Gosse

Faculty Mentor: Julie Gosse

Abstract: Cetylpyridinium chloride (CPC) is a positively-charged antimicrobial used widely in consumer products and agricultural processes at concentrations up to 3 millimolar, exposing much of the U.S. populace to significant levels of CPC. There is minimal information on CPC's eukaryotic toxicology; hence, there is an urgent need for research. Mast cells, ubiquitous throughout the human body, are implicated in many diseases and key players in normal immune and nervous system functioning. We have demonstrated that low-µM doses of CPC potently inhibit the antigen (Ag)-stimulated functions of RBL-2H3 mast cells, including degranulation. We have investigated the molecular mechanism underlying CPC inhibition of degranulation. Following 30 min pre-exposure, CPC drastically inhibits Ag-stimulated Ca2+ efflux from the endoplasmic reticulum and also external Ca2+ entry into the cytosol, which is necessary for degranulation. These Ca2+ dynamics are triggered by early tyrosine phosphorylation events, including Syk and LAT phosphorylation. Using In-Cell Western, global tyrosine phosphorylation was inhibited by 30 min CPC pre-exposure. A more detailed probing using Western Blot showed that CPC does not inhibit tyrosine phosphorylation, including that of Syk and LAT. Analysis with ELISA confirmed that CPC does not inhibit the phosphorylation of Syk. Additional investigation will be done using varying antigen and CPC doses. This work provides molecular mechanisms underlying the effects of CPC on immune signaling. It allows the prediction of CPC effects on cell types that share similar signaling elements, such as T cells.

1042. Building Literacy in Microscopy and Reproducible Image Analysis

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Dominic Crowley Loren Genrich Marcus Ratz Sophie Trafton Karissa Tilbury Frédéric Bonnet

Faculty Mentor: Karissa Tilbury

Abstract: Microscopy is a ubiquitous tool to observe and quantify biological processes. Image processing through programs such as FIJI (ImageJ) can be used for data quantification and can improve the standard of microscopic images in data presentation. Despite the importance of these methods, proper training in the fundamentals of microscopy is limited. As the emphasis of microscopy images shifts from qualitative to quantitative, knowledge of the impact of image acquisition and processing is critical in creating quantitative, reproducible data. Here, data is presented from a microscopy course where we were educated in the fundamentals of image collection and quantitative analysis. We applied this tool-set to two distinct models: characterization of murine renal cells during drug response and therapeutic reversal of muscular aging using a C. elegans model system. Digital images of the renal tissue were produced using wide-field fluorescence microscopy and were then processed in FIJI; in these images, the brightness of the cell nuclei is associated with the amount of DNA. The renal cells treated with the drug had less intense nuclei signals, indicating a positive response. In the C. elegans muscular aging model, we used bright-field microscopy, where the worms were segmented in FIJI via pixel intensities. Segmented worms were then identified and tracked during a time-course to quantify worm speed. Using this assay, we found that the drug was able to restore muscular endurance in aged worms. In both models, the use of FIJI allowed for qualitative images to be quantified through a reproducible process.

1043. Biometric Enabled Aviation Helmet

Submission Type: Exhibit

Submission Category: Biomedical Sciences

Author(s):

Naomi Kihn Haley Florio Sadie Denico Giordano Luciani Karissa Tilbury

Faculty Mentor: Karissa Tilbury

Abstract: The number of fatigue-related aviation accidents is low, however, when they do occur, they can be catastrophic. Currently, no device can provide quantitative information about the status of pilots during their flights. The purpose of this capstone project is to create a device that provides a way to assess and monitor an aviation pilot's level of alertness remotely for flight safety. To accomplish this, we built a wearable sensor suite that consists of the following: a thermistor, camera module, accelerometer, and a heart rate and oximeter. This suite will be compatible with a pilot's headset or helmet. The thermistor will be placed directly on the skin to measure skin temperature. The camera will be placed away from the face to capture blinking rates. The accelerometer will be positioned on the back of the head to measure unexpected head movement. The heart rate and oximeter will be placed on the temple. Each sensor was tested and calibrated individually. To understand the effects of fatigue, results will be compared against the individual's baseline readings. When worn, the sensor suite will monitor the pilot's status in real-time. Our design illustrates that with a simple wearable sensor suite, quantitative data can be noninvasively tracked for the duration of their flight. This data can be used to assess the pilot's potential fatigue. The long-term goal for this device is to collect data to be able to better predict the fatigue level of pilots so that preventative measures can be taken to reduce the risk of fatigue-related errors.

1044. The Impact of Cxcr4/Cxcl12 on Migrating Muscle Precursors

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Sara Loiselle Jared Talbot

Faculty Mentor: Jared Talbot

Abstract: I investigated the effects of the chemokine gene Cxcr4 and its ligand Cxcl12a on the migration of muscle precursor cells in Zebrafish. Zebrafish are an ideal organism for this study because their development is visible through their embryos and they only have 3 major migratory muscle streams: neck, fins and chest muscles. Previous studies have suggested that Cxcr4/Cxcl12a plays an integral role in the migration of muscle cells and is required for guiding muscle precursor cells to the pectoral and pelvic girl in birds and mammals. It remains unclear whether Cxcr4/Cxcl12a function is conserved in boney vertebrates and if it acts globally to attract cells during migration. We hypothesized that the ligand-receptor pair Cxcl12a-Cxcr4 stimulates muscle precursor migration and growth in all hypaxial streams. Over the summer I genotyped Cxcl12a null mutants and examined the hypaxial muscles. I found reduced hypaxial muscle size in the cxcl12a mutant. Each muscle (fin, neck, and chest) in the cxcl12a null fish was about ³/₄ the size as the WT fish. My research into a Cxcr4-inhibitor, MSX122 showed a comparable reduction of all three muscle streams in Zebrafish. Together these findings suggest that Cxcr4/Cxcl12a plays an role in the outgrowth of hypaxial muscle precursor streams; however, hypaxial muscles can form in the absence of Cxcr4/Cxcl12a signaling which suggests that there are other important cues guiding these migratory cells. This work was supported in part by a CUGR fellowship (Summer 2021).

1045. Neuronal Transient Receptor Potential Melastatin-8 Cation (TRPM8) Channel may Regulate Bone Mass via Mesenchymal Stem/Stromal Cell Maintenance

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Audrie Langlais Adriana Lelis Carvalho Katherine Motyl

Faculty Mentor: Katherine Motyl

Abstract: Transient receptor potential cation channels (TRP) are expressed by osteoblasts (bone mineralizing cell) and osteoclasts (bone resorbing cell) to regulate cell differentiation. TRP channels are also expressed by sensory neurons which innervate peripheral tissues and can indirectly regulate osteoclasts and osteoblasts. Our lab is the first to identify a bone phenotype in mice lacking transient receptor potential melastatin-8 (Trpm8-/-). Trpm8-/- males have low vertebral bone volume fraction (bone volume/total volume) and decreased trabecular thickness determined by microcomputed tomography. Osteoblasts differentiate from Mesenchymal Stem/Stromal Cells (MSSCs) and reports by others show TRPM8 expression in a murine cell line (MC3T3-E1) and primary human MSSCs. This suggested the mechanism of bone loss could be due to changes in MSSC renewal and osteoblast differentiation. To determine if MSSCs are altered in Trpm8-/- mice, we cultured bone marrow stromal cells (BMSC's). Compared to wildtype controls, Trpm8-/- mice have reduced colony formation determined by crystal violet staining. Surprisingly, we could not detect Trpm8 expression in MC3T3-E1 cells by qPCR. Furthermore, treatment of BMSCs from C57BL6/J mice with WS-12, a selective TRPM8 agonist, did not influence cell growth. Lastly, in situ hybridization of Trpm8 mRNA in vertebrae shows expression in distinct subpopulations of dorsal root ganglion sensory neurons as expected, but not adjacent trabecular bone. Future studies will test if reduced cell proliferation or increased apoptosis occurs in Trpm8-/- MSSCs. Overall, our results support an indirect mechanism of Trpm8 signaling in sensory neurons on bone formation, rather than signaling within MSSCs.

1046. Smart Paper Diagnostics

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Emma Sperry Kara Frasier Dillon Kelley Francois Rukumbuzi James Beaupre

Faculty Mentor: James Beaupre

Abstract: Separating components of blood, such as plasma and erythrocytes, is important for diagnostic testing as it minimizes the interference of other cells when analyzing specific cell counts in order for health professionals to determine a diagnosis. Existing blood separation and diagnostic techniques, such as centrifugation, come with various downsides such as high costs and large stationary equipment, often leaving developing countries with little to no access to blood separation and testing. This project aims to develop a microfluidic device capable of separating particles for medical personnel looking to isolate samples in a way that is inexpensive to produce and portable. To do this, a microseparator was created in SolidWorks that utilizes a cross-flow design to separate two different-sized particles. The flow profile and particle tracing were modeled in COMSOL Multiphysics and Ansys. The results predicted the design would be effective, and most of the separation would occur at the beginning of the device. The design was 3D printed as a mold for silicone caulking and PDMS to create prototypes. Plexiglass was sealed on top of the prototype which allowed for visualization of the movement of particles. Particle separation was measured in terms of percentage of sample filtered, time to complete separation, the volume of leakage and backflow, and flow efficiency using ImageJ for image analysis. These experiments will allow analysis of particle behavior in a cross-flow microseparator and further design development could lead to more accessible blood separation techniques in developing countries.
1047. Interferon Response Factor 7 is a Transcriptional Target of Nuclear Factor Kappa B (NFkB)-Mediated Inflammation Following Influenza A Virus Infection

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Wyatt Cannell Emma Boudreaux Sarah MacLeod Brandy-Lee Soos Benjamin King

Faculty Mentor: Benjamin King

Abstract: Between 2010 and 2020 approximately the U.S. recorded 12,000-52,000 influenza-related fatalities annually. Although vaccines for this infection are widely administered, the diversity of influenza strains that circulate seasonally among varying populations can render them less effective. In order to develop therapies to better prevent severe illness, further research regarding how the immune system responds to influenza infection is needed. One immune response of interest is the over-activation of neutrophils, the first immune cells to respond to infection and initiate an inflammatory response. This over-activation can cause damage to many different tissues, but the characterization of the mechanisms required to balance this effect remains incomplete. However, nuclear factor kappa B (NFkB) is a transcription factor known to regulate inflammation by activating and deactivating target genes. This study tested the hypothesis that NFkB activation initiates an inflammatory response which includes a set of target genes that regulate neutrophil function in response to influenza A virus (IAV) infection. Since embryos only have functional innate immune cells, including neutrophils, this study used IAV-infected zebrafish embryos. Using data collected from this model, RNA sequencing data was analyzed and 76 NFkB target genes were found to be differentially expressed at 6 hours post-infection (hpi). Additionally, Interferon response factor 7 (irf7), a gene that has been shown to regulate immune response to RNA viruses like IAV, was differentially expressed at 6 and 12 hpi using quantitative real-time PCR. This study provides the necessary foundational data regarding the regulatory mechanisms of neutrophils during IAV infection.

1048. Nociceptor Sensitivity in Larval and Adult Drosophila

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Christine Hale Samia Pratt Julie Moulton Geoffrey Ganter Emma Boudreaux

Faculty Mentor: Geoffrey Ganter

Abstract: Nociceptive sensitization underlies and perpetuates chronic pain, a condition that affects ~50 million adults nationwide. With many treatment options for chronic pain, such as opioid analgesics, carrying numerous deleterious side effects, research into safer and more effective treatment options is crucial. Recently, a nociceptive sensitization model was developed using Drosophila melanogaster larvae, in which UV-injured or genetically modified animals become hyper or hypo-sensitive. Using this model, the necessity and sufficiency of a novel pathway, the Bone Morphogenetic Protein (BMP) pathway, functioning in the nociceptors, was revealed. We have continued to build upon this knowledge to reveal a more complete mechanism for how nociceptive sensitization occurs by investigating into the potential roles of other novel genes/signaling pathways including, arm, a component within the Wnt/Wg signaling pathway. At present, our findings indicate Arm to be a facilitator in controlling nociceptor sensitivity. In addition to our focus on mechanisms that promote hypersensitivity, we also propose to expand our efforts by bringing new focus to more chronic nociceptor sensitization conditions. To facilitate these efforts, because the larval stages of fruit fly development are relatively brief, we are also developing a methodology that allows longer term experimentation of nociceptive sensitization after injury in adult fruit flies. Recent efforts toward this goal include mapping the adult fruit fly nociceptor distribution by confocal microscopy and developing thermonociception methods for use with adult flies. Our ultimate aim is to better understand the mechanisms of nociceptive sensitization so that better treatment options for chronic pain may be revealed.

1049. Life-long Dietary Restrictions have Negligible and Potentially Damaging Effects on Late-life Cognitive Performance in the Diversity Outbred Mouse Population

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Andrew Ouellette Niran Hadad Andrew Deighan Laura Robinson Adam Freund Gary Churchill Catherine Kaczorowski

Faculty Mentor: Catherine Kaczorowski

Abstract: Although aging remains the greatest risk factor for developing cognitive decline and Alzheimer's dementia, to date, no anti-aging interventions have been proven to modify the onset or progression of cognitive symptoms in the elderly population. Several studies have reported that intermittent fasting (IF) or caloric restriction (CR) interventions, which reliably increase lifespan across a variety of model organisms and humans, can also improve late-life cognitive outcomes, while others have reported no or limited beneficial effect of CR and IF on cognition. Here, we compare the effects of 4 feeding paradigms (1 day IF, 2 day IF, 20% CR and 40% CR) to ad libitum (AL) on Y-maze working memory decline (longitudinal 10 vs 22 mo) and long-term memory using contextual fear memory (CFM, 24 mo) in a large population Diversity Outbred (DO) mice that model the complex genetic architecture of humans. As expected, we observed a significant increase in survival in CR and IF groups at 24 months compared to mice fed AL, however there was no benefit of 20% CR and 1 or 2 day IF on working memory or long-term CFM. Furthermore, we report that severe 40% CR has damaging effects on CFM at 24 months of age. Using Quantitative Trait Loci mapping we identified the gene Slc16a7, which codes the lactate and pyruvate transporter protein MCT2 (Monocarboxylate transporter 2), to be associated with late-life long-term memory outcomes in mice on lifespan promoting feeding

paradigms. We find that strongly associated variants from DO founders strains within the Slc16a7 locus confer enhanced late-life long-term memory outcomes. Overall, limited utility of dieting and fasting on memory improvement in mice that recapitulate genetic diversity in the human population highlights the need for anti-aging therapeutics that promote cognitive function.

1050. Optimization of Proteolytic Collagen Degradations to Enable Identification of SHG Signatures Associated with Proteolytic Degradation

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Madison Mueth Jordan Miner Karissa Tilbury

Faculty Mentor: Karissa Tilbury

Abstract: The dynamics of collagen remodeling within the tumor microenvironment are critical for tumor initiation, promotion, and metastasis. Tumorigenic microenvironments frequently are characterized by fibrosis and stiff collagen; however, matrix metalloproteinases (MMPs), enzymes that degrade the extracellular matrix proteins including collagen, are commonly upregulated. Collagen imaging studies using Second Harmonic Generation (SHG) imaging demonstrate differences between normal and cancerous tissues; however, these studies lack specificity of the dominant state of collagen remodeling. Here we develop a collagen gel model exclusively focused on the proteolytic degradation of collagen to identify SHG signatures associated with proteolytic degradation. Collagen gels were degraded using a broad-spectrum collagenase. Collagen degradation was confirmed using the autofluorescence of exposed tyrosine (EX 270 nm/EM 330 nm). Controlled collagen degradation using EDTA, a collagenase inhibitor, resulted in partially degraded collagen gels based on stable tyrosine autofluorescence intensity and visual inspection. The partially degraded collagen gels were imaged using SHG microscopy and compared to fully intact collagen gels. Visually, the partially degraded collagen gels have more compact, shorter fiber structures. Further analysis of the directionality of the SHG signal is underway. The directionality of SHG is sensitive to fibril packing within collagen fibers and is more closely aligned with the size-scale of cellular interaction with collagen fibers. This knowledge will improve our understanding of the dynamics of collagen remodeling which is critical for the development of novel therapeutics.

1051. Novel Gordonia Phage StarStruck: A Shining Light for Discovery

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Julia Coombs Eleanor Carrolton Wyatt Cannell Addie Gambol Mchenna Martin Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: Filamentous bacteria like Gordonia terrae pose economic, environmental, and health risks by diminishing wastewater treatment efficiency. Bacteriophages (phage), viruses which infect bacteria, can be used to reduce G. terrae populations improving wastewater treatment. Phage are the most abundant biological entities representing 1031 particles in Earth's biosphere, but only 634 G. terrae phage have been sequenced. StarStruck, a novel phage, was isolated through an enriched G. terrae sample and sequenced for characterization of it's genome to better understand phage diversity. Phamerator, HHPRED, PhagesDB, and NCBI Blast were all used to annotate the genome of StarStruck. StarStruck is a cluster CR2 phage, meaning it shares more than 35% of its gene content with cluster members. StarStruck's genome is 68,128 bp long, contains 91 genes, and has a 65.4% GC content. StarStruck is a lytic phage which lyses the cells it infects, while most G. terrae phages are temperate and integrate genomes with their hosts. As a lytic phage, StarStruck encodes lysin A (gp 49/50), lysin B (gp18), holin (gp15), and a HicA toxin (gp6). Despite being a lytic phage, StarStruck encodes a temperate resolvase (gp59) associated with excising from the host genome, representing a potential horizontal gene transfer indicative of phage evolution and diversity. More phage should be isolated and compared genomically to improve our ability to control bacterial populations in wastewater treatment plants and to learn about their potential use as antibacterial treatments in medicine.

1052. Mitochondrial Toxicity of Antimicrobial Agent Cetylpyridinium Chloride

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

John Burnell Sasha Weller Brandon Aho Bright Obeng Samuel Hess Julie Gosse

Faculty Mentor: Julie Gosse

Abstract: People are exposed to high concentrations (up to 3 millimolar) of antibacterial agent cetylpyridinium chloride (CPC) via consumer products and agricultural use despite a lack of knowledge of CPC's effects on eukaryotes. We found that non-cytotoxic, low-micromolar doses (~1000-fold lower than those used in products) of this positively-charged quaternary ammonium compound inhibit ATP production in rat immune RBL-2H3 mast cells in galactose media, which forces the cells to use their mitochondria for ATP production. CPC potently inhibits ATP production starting at 0.5 µM within a 90-minute exposure. CPC inhibits half of mitochondrial ATP production at 1.5-1.9 µM, a range similar to the 1.2 µM concentration seen for a canonical mitotoxicant CCCP. Mitochondrial [Ca2+] disruptions can lead to mitochondrial deformation and dysfunction. Thus, we tested CPC effects on mitochondrial Ca2+ levels with a fluorescent reporter (CEPIA2mt) and found that CPC lowers mitochondrial [Ca2+] in galactose media. Another potential underlying mechanism is CPC interference with key lipid phosphatidylinositol 4,5-bisphosphate (PIP2). Previous work revealed that multiple PIP2-protein interactions are disrupted by CPC, and other researchers have shown that disruption of PIP2 in the mitochondrial outer membrane leads to mitochondrial fission. Thus, we utilized super-resolution fluorescence photoactivation localization microscopy (FPALM) of Dendra2-TOM20 (outer mitochondrial membrane marker) in live mast cells: CPC causes nanostructural changes to mitochondria including production of "donut" morphology. Overall, this work reveals CPC as a mitochondrial

toxicant despite its widespread use, highlighting the importance of further research into its toxicological safety.

1053. Variable Mest Expression in Genetically Identical Mice Contributes to Obesity

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Madeleine Nowak Rea Anunciado-Koza Crystal Bilodeau Edward Jachimowicz Robert Koza

Faculty Mentor: Robert Koza

Abstract: The environment and genome interact through the epigenome. This interaction can lead to variable phenotypes, even when individuals are genetically identical. In an otherwise genetically identical inbred mouse population, raised in carefully controlled environmental conditions, we showed dramatic inter-individual variation in their development of diet-induced obesity. Adipose expression of mesoderm specific transcript (Mest), an imprinted gene only expressed from the paternal allele, is consistently and positively associated with fat mass expansion in mice. Furthermore, levels of Mest expression in adipose tissue biopsies of mice prior to feeding dietary fat can predict future development of obesity. This suggests that the epigenome has a role in the regulation of Mest. Mest is primarily expressed by mature adipocytes, but adipose tissue is heterogeneous with 50-90% of cells being non-adipocytes. To enhance the likelihood for identifying epigenomic features controlling variable Mest expression in adipocytes, we used the NuTrap mouse model developed by Roh et al. (2017) which allows us to isolate mature adipocyte nuclei using a nuclear fluorescent marker tied to adiponectin expression. The overarching goal of this project is to use NuTrap mice to isolate nuclei from mature adipocytes from inguinal and visceral fat tissues to discover the epigenetic source of variable Mest expression. We have optimized nuclei isolation via fluorescence activated cell sorting (FACS) and isolated RNA from adipose tissue to confirm Mest expression levels. We have also begun to identify the optimal methods for sequencing studies to identify differences within the genome associated with variable expression of adipocyte Mest in mice.

1054. Exercise Induced Growth Factor Increases as a Function: Translational Project Among Human and Animal Models of Preclinical Alzheimer's Disease

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Amanda Wain Kate Foley Lindsey Lagerstrom Jennifer Thompson Taylor Mcmillan Fayeza Ahmed

Faculty Mentor: Fayeza Ahmed

Abstract: Alzheimer's disease (AD) is incurable [1], thus research on delaying onset or prevention of AD focuses on modifiable risk factors [2]. There is overwhelming evidence of a vascular contribution to AD [3]. Growth factors that regulate neurogenesis and angiogenesis play an essential role in brain health and homeostasis. The pathological changes in these factors are early predictors of cognitive decline and dementia [4]. Regular exercise increases both peripheral and neuronal growth factors mirroring the protective effects of elevated intrinsic levels, though the degree of benefit is still unclear. This may be due to the age group studied and the limitations of confounding variables inherent in human subjects research. Given AD pathology begins decades before symptom onset [5], studying middle-aged adults may be a critical period for AD prevention. In a new translational project between the Ahmed and Howell labs, we characterized these growth factors (BDNF, VEGF, and an understudied factor, FGF-21) based on exercise level among both mice and humans, including those at genetic risk for AD.

Using a mouse model, genetically modified with humanized APOE3/4 (AD genetic risk allele) we investigated the effects of exercise and the ability of this animal model to translate to active or sedentary, midlife community participants. Data analysis is in progress. If the model proves to be translatable, longitudinal intervention studies can be shortened by decades in order to find ways of preventing, delaying or reversing Alzheimer's disease and vascular dementia.

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Oct;30(10):489. PMID: 17765329.

1055. Characterization of Four Novel Prophages and Their Polymorphic Toxin Systems in the Pathogenic *Mycobacterium salmoniphilum*

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

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Wyatt Cannell	Eleanor Carrolton
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Sally Molloy	

Faculty Mentor: Sally Molloy

Abstract: *Mycobacterium abscessus* is a non-tuberculosis pathogenic bacterium that causes soft tissue and pulmonary infections in Cystic Fibrosis patients (CF) that are often completely drug resistant. Previous studies have shown that a significant portion of *M. abscessus* isolates carry prophages which are predicted to contribute to pathogenicity and antibiotic resistance. To better understand the relationship between prophages and pathogenicity, we sequenced the genome of the fish pathogen, *Mycobacterium salmoniphilum* (MSKB-2), a close relative of *M. abscessus*. Using the program Phaster, we identified four novel prophages that share at least 35% gene content with *M. abscessus* prophages and therefore were assigned to Mab clusters. ProphiMSKB2-2, prophiMSKB2-3 and prophiMSKB2-4 have genome lengths of 61,691bp, 72,955 and 34,502 bp and were assigned to clusters MabE, MabK and MabN, respectively.

ProphiMSKB2-1 is distinct from *M. abscessus* prophages already described, although nearly identical sequences exist in sequenced genomes of clinical *M. abscessus* isolates in GenBank. We recommend a novel cluster assignment to MabS. ProphiMSKB2-4 has a large deletion in its structural gene region and likely cannot form active phage particles. ProphiMSKB2-1, prophiMSKB2-2, and prophiMSKB2-4 encode polymorphic toxin systems which are predicted to contribute to bacterial virulence. Further analysis of the role these genes play in bacterial virulence and pathogenicity is imperative to the discovery of new and more effective treatments.

1056. Asymmetric Catalysis of Chiral Phosphate Mimics

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Rebecca Collins Ahmed Numan Matthew Brichacek

Faculty Mentor: Matthew Brichacek

Abstract: Over the past decade, antisense oligonucleotides— chiral phosphonates which mimic the phosphodiester backbone of RNA— have been evaluated as therapeutics to target mRNA and block diseases causing deficient protein expression. However, the stereochemical arrangement of the chiral phosphonates has an effect on their biological activity. Currently, in the synthesis of antisense oligonucleotides, the stereochemistry of the phosphorus is not controlled. Chiral nucleophilic catalysts can be employed to produce the biologically active product with a high enantiomeric excess (ee). Previous work by the Brichacek group identified the catalyst benzotetramisole (BTM), which possesses these enantioselective capabilities and provides a modest yield of the active enantiomer (~43% average ee). In this study, the synthesis of a novel asymmetric catalyst, hyperbenzotetramisole (hyperBTM) was pursued. BTM and hyperBTM will each be screened in a chiral phosphonate synthesis to determine their respective selectivities.

1057. Novel Method of Measuring Bone Density Using Audible Sound

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Evan Bess Justin Williford Michael Mason

Faculty Mentor: Michael Mason

Abstract: Osteoporosis is a medical condition where there is a progressive degradation of bone tissue which correlates with a characteristic decrease in bone mineral density (BMD). Populations most at risk for developing osteoporosis include post-menopausal women, diabetic patients, and the elderly, which represent a large population within the state of Maine. Current methods of assessing BMD are expensive and can expose patients to small doses of ionizing radiation. The purpose of this work is to develop a device that can be used as a rapid, low-cost, noninvasive diagnostic tool to measure calcaneal bone density using audible sound. To do this, a LabVIEW 2019 software package was developed, and two physical devices were constructed. The two prototypes contained three primary components, a single speaker and two microphones positioned 90° and 180° from the speaker. The components used in each device was validated through power spectrum analysis with a focus on power transmission through air. Preliminary results show an ability of the components to distinguish different levels of power being transmitted through air at different thicknesses.

Acknowledgements:

The authors thank Professor Michael Mason, Dr. Todd O'Brien, Forrest Flagg, and Dr. Robert Bowie for their critical advice and support during this project.

1058. Skin Formation of Crosslinked TEMPO Cellulose Nanofiber Hydrogel

Submission Type: Exhibit

Submission Category: Biomedical Sciences

Author(s):

Jacob Holbrook Kora Kukk Michael Mason

Faculty Mentor: Michael Mason

Abstract: Due to the high risk of viral, bacterial, fungal, and parasitic disease being present in aquaculture production, it is necessary to develop a new method of vaccination that is not only economical but also effective in long term prevention of disease. A potential method for economical and effective aquaculture is through the production of an antigen encapsulated in a crosslinked TEMPO cellulose hydrogel. These hydrogels are produced by dropping 1.7% weight TEMPO cellulose nanofibers (CNF) into a citric acid solution that is left to physically cross-link over a 24 hour time period before being washed for an additional six days. After the completion of the wash steps, the hydrogel is dried in preparation for delivery into the fish. The aim of this study is to determine how the hydrogel behaves as it is being dried. In order to accomplish this goal, the TEMPO CNF will be complexed with a cationic dye which will be attracted to the negatively charged TEMPO CNF matrix. The cationic dyed hydrogels will be analyzed as they dehydrate to show the possible presence of skin formation. A custom built imaging device will be used to visualize the localization of the indicator dyes as a function of time as the hydrogel dehydrates. This imaging device consists of an optical camera and single lens to image the cross section of the hydrogel at multiple dehydration stages. Recent findings and engineered imaging setup will be presented.

1059. Time-lapse Imaging Reveals That Muscle Precursor Position is a Key Determinant of Fin Muscle Fate in Zebrafish

Submission Type: Exhibit

Submission Category: Biomedical Sciences

Author(s):

Carolina Cora

Jared Talbot

Faculty Mentor: Jared Talbot

Abstract: Limb muscle formation is a result of a multistep process in vertebrate embryonic development. First, muscle-forming cells generate segments along the anterior-posterior body axis called somites. Next, migratory muscle precursors (MMPs) detach from the ventral portion of somites and move distally to give rise to hypaxial skeletal muscles. In zebrafish embryos, fin muscle is formed by the middle fork of three cell streams emanating from somites 1 through 6. To better understand how fin muscle arises, we conducted high-resolution time-lapse imaging using a newly updated confocal microscope. We imaged a transgenic fish line that expresses green fluorescent protein in the membrane of muscle precursors and mature muscle cells, allowing us to follow MMP migration and differentiation. Then, with a machine-learning driven program, we identified multiple cell centers and tracked the movement of individual MMPs in three dimensions. The tracking was challenging, due to the difficulty of automating recognition of numerous cell-centers through different planes and correctly connecting these cells between multiple timepoints. Nonetheless, we were able to create a trajectory for the MMPs over many hours of development. By examining tracks through this time-period, our analysis brought new clarity to the origins of fin muscle, suggesting that the fin develops from cells that arise from the 4th somite specifically, and that original MMP position is a strong determinant of future muscle outcome.

1060. ColorFlu Zebrafish: An In Vivo Fluorescent Influenza A Virus Infection Model

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

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Faculty Mentor: Benjamin King

Abstract: Influenza virus infection can cause severe respiratory disease and is estimated to cause 9-41 million illnesses annually in the US. The long-term goal of our research is to understand how the innate immune system responds to influenza virus infection to inform the development of new therapies. Zebrafish embryos are powerful models to study innate immunity in response to influenza A virus (IAV) infection since adaptive immunity is not fully functional until several weeks after development. While the function of immune cells can be studied in vivo using fluorescent reporter lines, a significant limitation is the ability to visualize the virus. To overcome this limitation, we developed new methods to study IAV infection in zebrafish by using four different fluorescent IAV strains, called ColorFlu. Using our ColorFlu zebrafish infection model, we can monitor IAV infections and the subsequent innate immune response in real-time. We have used this model to study how neutrophils, generate and release reactive oxygen species (ROS) while responding to infection. .ROS can degrade pathogens directly through oxidative damage. However, dysregulation of ROS can lead to tissue damage and death due to hyperinflammation. We hypothesize that regulation of neutrophil ROS production is mediated by gene networks composed of both coding and noncoding genes. To investigate our hypothesis, we have been studying how inhibitors of ROS alter survival, viral burden, and neutrophil migration using ColorFlu. The ColorFlu zebrafish model of IAV infection is a powerful new tool to visualize the impact of genetic and drug therapeutic interventions on IAV infections.

1061. Toxin/Antitoxin Systems in Prophage Genomes Could Increase Virulence in the Host, Group B Streptococcus.

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Kaitlyn Jodoin Caitlin Wiafe-Kwakye Melody Neely

Faculty Mentor: Melody Neely

Abstract: Group B Streptococcus (GBS) is the leading cause of neonatal meningitis. Found most commonly in the female reproductive tract, GBS is an opportunistic pathogen that disproportionately infects neonates during pregnancy or soon after birth. Bacteriophage (phage) are bacterial viruses and are the most numerous entity on earth. Phage have the ability to integrate their phage genome into the bacterial host genome, becoming a prophage. Once integrated, the prophage genes are able to be expressed by the bacteria. Multiple other strains of bacteria have prophages that promote increased bacterial fitness and virulence. However, not much is known about the prophages that are found in GBS. Therefore, the aim of this study is to determine how prophages might contribute to virulence in GBS. A total of 49 GBS clinical isolates were collected from the vaginal tracts of pregnant females and a total of 43 prophages were identified. phiDMC20 is a prophage isolated from GBS strain DMC20, which is a serotype V, clonal complex 19 bacteria. The bacterial genome was sequenced and the prophage genome extracted and annotated. phiDMC20 has a genome length of 36680 base pairs with 55 putative genes. phiDMC20 is significant due to the presence of a HicA/HicB toxin/antitoxin system. The presence of these toxin/antitoxin systems likely provide significant advantages to the host bacterium by increasing virulence. Future research includes continuing to annotate the 26 other prophages extracted from GBS clinical isolates and also investigate the effect these toxin/antitoxin systems have on virulence.

1062. Deciphering the Signaling Mechanisms of JC Polyomavirus

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Remi Geohegan Michael Wilczek Lauren Cusson Sophie Craig Melissa Maginnis

Faculty Mentor: Melissa Maginnis

Abstract: JC polyomavirus (JCPyV) causes a persistent, asymptomatic infection of the kidneys in up to 80% of the population. In immunocompromised individuals the virus reactivates, traffics to the brain, and infects astrocytes and oligodendrocytes. The gradual loss of these cells results in progressive multifocal leukoencephalopathy (PML), characterized by cognitive dysfunction, motor impairment, and death. There is no current cure for PML. To develop successful treatments, it is critical to better understand how the virus takes over host-cell signaling pathways for successful infection to identify potential targets. JCPyV activates extracellular signal-regulated kinases (ERKs) within the mitogen activated protein kinase (MAPK) pathway, a cell signaling pathway commonly exploited by viruses for its role in cellular differentiation, proliferation, and death. ERK becomes activated as early as fifteen minutes post infection, and treatment of cells with ERK inhibitors reduces JCPyV infection, while treatment of cells with a chemical ERK activator, PMA, increases JCPyV infection. The mechanism by which ERK becomes activated during infection, is not fully defined, yet upstream signaling proteins of the MAPK pathway could play an important role in signal activation and viral infection. SRC, a protein tyrosine kinase and upstream signaling molecule of the MAPK pathway, was targeted for knockdown, and JCPyV infection was measured. Taken together, this research provides a better understanding of cellular signaling events during JCPyV infection and will improve the possibility of finding targets for novel antiviral treatments for PML.

1063. Defining the Role of Src Kinase in Activation of the MAPK/ERK Signaling Pathway During JCPyV Infection

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Lauren Cusson Remi Geohegan Sophie Craig Melissa Maginnis

Faculty Mentor: Melissa Maginnis

Abstract: JC polyomavirus (JCPyV) infection is established in approximately 50-80% of the adult population, as a persistent asymptomatic infection of the kidneys. In immunocompromised individuals, the virus can spread to the CNS, cause a lytic infection, and progress into the fatal demyelinating disease, progressive multifocal leukoencephalopathy (PML). There are currently no approved treatments for PML, and thus it is critical to better define viral infection of host cells to identify potential treatments. Successful JCPyV infection relies on the manipulation of the mitogen activated protein kinase pathway (MAPK), which is responsible for relaying extracellular mitogenic signals into the cell to allow for the proper cellular response. The specific activation of the MAPK pathway upon JCPyV infection has yet to be fully understood. To define how the MAPK pathway becomes hijacked by JCPyV, the goal of this project is to determine whether Src, a tyrosine kinase known to activate the MAPK pathway, is required for activation of MAPK/ERK during JCPyV infection. Cells treated with inhibitors of Src, to limit ERK activation, will be analyzed for JCPyV infection. Taken together, this research will help to better define virus-induced cell signaling mechanisms that lead to viral infection and identify potential targets for PML treatment.

1064. Tailoring Personalized Medicine to Treat Diseases Caused by Genetic Mutations

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

George Horvat Katelyn Amero Lindsey Stover Alison Kueck Denry Sato Bruce Stanton Benjamin L. King

Faculty Mentor: Benjamin L. King

Abstract: Personalized medicine can predict responses to treatments according to a donor's genotype in diseases like cystic fibrosis. Cystic fibrosis is caused by various mutations in the CFTR gene which encodes a chloride ion channel protein. The Δ F508 mutation in exon 11 is the most common cause of the disease, and the M470V polymorphism can worsen symptoms. Mutations in exon 4 and 5 of the CYP2C19 gene, which codes for an oxidative enzyme, can predict issues with treatments like the anticoagulant plavix. In this study, anonymous volunteers were screened for the presence of mutations in the CFTR and CYP2C19 genes. Genomic DNA was extracted from sputum samples. The desired exons were amplified using PCR and sequenced for screening. The CYP2C19 PCR products were further subjected to a restriction enzyme assay that was analyzed using gel electrophoresis. Analysis of donor samples A-L showed that all were wild-type for the Δ F508 mutation on the CFTR gene, meaning it does not cause cystic fibrosis. The donors were either heterozygous or homozygous for the M470V mutation, which does not cause the disease but would have the potential to worsen symptoms if the donor had cystic fibrosis caused by another mutation. For CYP2C19, all donors were either wild-type or heterozygous for the polymorphisms on both exons. Therefore each donor has at least one wild-type allele that produces a functioning enzyme which activates Plavix. For donors who are heterozygous on one or both exons, Plavix may be less effective due to the mutated alleles.

1065. The Regulation of Autophagy During The Yeast Pheromone Response

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Mustafa Elhefnawi Cory Johnson Joshua Kelley

Faculty Mentor: Joshua Kelley

Abstract: G-Protein coupled receptors (GPCRs) are essential regulators for many cellular processes and are the largest family of proteins targeted by 35% of FDA approved drugs. Yeast use a GPCR signaling pathway to mate that results in elongation or "shmoo" formation. Endocytosis is a major mode of GPCR regulation, during pheromone response, where the cell internalizes the pheromone receptor. In this process the cell engulfs activated receptors for degradation. The degradative process of these receptors is known as autophagy. Cells use endocytosis and autophagy of activated receptors to downregulate and desensitize pheromone response. We proposed that when yeast respond to pheromone, autophagy the homeostatic degradative process is initiated. Our aim was to determine the molecular mechanisms that link receptor endocytosis to autophagy via an epsin-mediated pathway during the yeast pheromone response. More specifically, we hypothesized that epsins, the endocytic adaptor proteins that facilitate the formation of endocytic pits and are integral to receptor endocytosis, differentially affect downstream autophagic mechanisms. To investigate yeast autophagy, we investigated the differential roles epsins serve in pheromone-induced autophagy. Through live-cell imaging, we found that deletion of Ent1 results in the formation of fewer autophagic bodies in comparison to either wild type cells, or those lacking Ent2. Ultimately, we identified that one of the epsin proteins (Ent1) plays a major role in the regulation of autophagy during cellular stress.

1066. Exploring Proteomic Signatures of Lean Perivascular Adipose Tissue Induced by Methionine Restricted Diet

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Marissa McGilvrey Bethany Fortier Calvin Vary Robert A Koza Lucy Liaw

Faculty Mentor: Lucy Liaw

Abstract: Perivascular adipose tissue (PVAT) surrounds blood vessels and regulates vascular tone. During obesity, inflammation and increased lipid storage in PVAT alter its signaling. In humans, the amount of PVAT increases with obesity and positively correlates with coronary artery disease. Methionine-restricted (MR) diets extend lifespan, improve glucose metabolism, and decrease adiposity despite diet-induced obesity in rodents. Positive effects of MR on white adipose tissue have been attributed to increased energy expenditure and browning. However, MR has only been investigated over long-time courses, and effects on PVAT are unknown. To identify initiating signals from PVAT that correspond to phenotypic conversion, we fed male C57BL/6 mice with a high fat diet (60 kcal% fat, 0.86% methionine) until they were obese. Weight matched mice were then either maintained on this diet or switched to a high fat/methionine restricted diet (60 kcal% fat, 0.12% methionine). Mice on this MR diet lost weight and had significantly reduced lipid in PVAT as early as 3 days after initiation. We performed proteomics with PVAT collected after 3, 5, or 10 days of MR analyzed tissues by mass spectrometry to identify proteomic signatures. When compared to control, PVAT from MR conditions exhibited significant differences (p<0.05) in with 705, 437, and 581 proteins on days 3, 5, and 10, respectively. Gene Ontology Enrichment Analysis revealed biological processes related to "spliceosome", "fatty acid metabolism", "AMPK signaling", "collagen fibril organization", and "regulation of heart rate". These results suggest PVAT metabolic reprogramming occurs early in MR and may explain long term benefits.

1067. Cardiac Risk and Cognition in Middle Aged Adults

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Jaclyn Hazlewood Sarrah Marcotte Jennifer Thompson Fayeza Ahmed

Faculty Mentor: Fayeza Ahmed

Abstract: Abstract: Alzheimer's disease (AD) is considered a disease that begins in older adulthood; however, the pathological processes at fault begin decades earlier[1], indicating research should include middle-aged samples. Researchers are now looking at how individuals' lifestyle choices may aid or prevent this precursory decline in their cognition i.e. "modifiable risk factors". Given the known association between vascular function and AD (CITE), we aimed to investigate the association between The Framingham Risk Score (FRS) is a calculation of one's risk for developing cardiovascular disease (CVD) by measuring their risk factors of sex, cholesterol levels, blood pressure, diabetes diagnosis, and smoking history [3]. This current study aims to compare the cognitive abilities of a middle-aged population to their cardiovascular risk score using linear regression models. Several domains of cognition were obtained, including attention, learning/memory, processing speed, language, and executive functions. Additionally, APOE risk genes were collected for a subset of this sample. Finding a more explicit correlation between brain health and cardiovascular health in middle ages will help determine preventative strategies, like exercise, to mitigate AD risk. These pathological links will also allow for a better understanding of the early development of AD in asymptomatic middle aged adults. Data collection and analyses are currently in progress.

Acknowledgements: This project is part of a larger study in the faculty mentor's lab. References:

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1068. Sentinel Spectroscopy: Light-Surface Interactions for the Continuous Detection of Chemical Composition in Space Agriculture Runoff

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Christopher Erb Liza White RJ Perry Caitlin Howell

Faculty Mentor: Caitlin Howell

Abstract: The success of long-haul space travel and semi-permanent bases on Earth's moon and on Mars will heavily rely on optimized agricultural practices and agricultural analytics. Monitoring the health of space-grown crops in real-time, through the detection of chemical contaminants in plant effluent, will prove critical to efficiently supplying astronauts with sustainable food options. Our lab is developing a low-cost, automated detection system to analyze runoff from space-based agriculture using a mass-produced, nanopatterned material from Maine's paper industry. This system will make use of the fact that the way in which light interacts with the nanopatterned material changes as the light passes through effluent containing different chemical compounds and biomolecules. Reliable and effective low-cost water monitoring systems are vital to humankind's effort at establishing permanent extraterrestrial colonies.

1069. A Model to Study the Direct Effects of β 2-Adrenergic Receptor on Osteoclasts

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Rebecca Peters Audrie Langlais Ryan Neilson Katherine Motyl

Faculty Mentor: Katherine Motyl

Abstract: The sympathetic nervous system (SNS) contributes to bone homeostasis through beta adrenergic (βAR) signaling. The SNS signals to the osteoblast, which secretes RANKL to bind the RANK receptor on osteoclasts and stimulate bone resorption. However, we hypothesize that direct β AR signaling to the osteoclast may also occur because when mice were treated with a β-blocker, bone resorption was reduced without changing RANKL. Osteoclasts express β1AR and $\beta 2AR$, but $\beta 2AR$ is more highly expressed in bone. To determine the effects of $\beta 2AR$ on osteoclast differentiation and resorption, we crossed Adrb2fl/fl mice with the myeloid lineage specific Lyz2Cre/Cre mice to generate an osteoclast progenitor knockout of Adrb2. To test deletion of Adrb2 within the osteoclast, we measured gene expression of Adrb2 in the bone marrow and found comparable levels of deletion in Cre/Cre and Cre/+ mice. We also found reduced levels of Adrb2 in Cre/+ mice as compared to +/+ in osteoclasts from femur sections using RNAScopeTM. Additionally, we measured areal bone mineral density and bone microarchitecture at 8 weeks of age and found no significant changes among femur bone parameters in either sex. This is consistent with the finding that bone is not affected in Adrb2 global knockout mice until six months of age. At this point, we have validated the Adrb2fl/flLyz2Cre/+ mouse model to study the direct role of β 2AR on osteoclasts. Future work will use this model to study differences in osteoclast differentiation and resorption with the loss of β2AR using aging and pharmacological models to stimulate SNS activity.

1070. Mycobacterium chelonae Prophage ProphiMSKB1-4: Armed and Prepared to Translate

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Abigail McNally Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: Mycobacterium abscessus causes skin and pulmonary infections in those who are immunocompromised or have cystic fibrosis. These infections are extremely hard to treat because they are almost entirely resistant to antibiotics. Most strains of M. abscessus, and other related pathogenic mycobacteria such as M. chelonae contain prophage, or integrated viral genomes, that may increase host pathogenicity. To learn more about the prophages of pathogenic mycobacteria we sequenced the genome of an M. chelonae strain, MCKB1, isolated from a diseased fish. Using the program Phaster we identified four novel prophages that shared high gene content with the prophages of M. abscessus. Based on shared gene content, each of the prophages were assigned to *M. abscessus* clusters: prophiMCKB1-1, cluster MabF; prophiMCKB1-2, cluster MabN; prophiMCKB1-3, cluster MabK; and prophiMCKB1-4, cluster MabI. ProphiMCKB1-4 is found on contig 7, has a genome length of 76,080 base pairs, encodes 137 genes, and 24 tRNAs. One unique feature of prophiMCKB1-4 is the polymorphic toxin system adjacent to the left attachment site, which is predicted to contribute to mycobacterial virulence. In future research we will complete the genome annotation and further characterize the polymorphic toxin systems and its potential role in mycobacterial virulence and antibiotic resistance.

1071. The Effects of Antifungals on *Candida albicans* growth in the presence of Group B Streptococcus

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Anna Lane Kathryn Patenaude Melody Neely

Faculty Mentor: Melody Neely

Abstract: Streptococcus agalactiae (GBS) and Candida albicans (Ca) are opportunistic commensal microorganisms that colonize the vaginal tract of some individuals. While GBS typically exists commensally within its host, it can be passed to neonates during vaginal birth and cause life-threatening infection. Ca is an opportunistic pathogen that commonly causes vulvovaginal candidiasis and can cause infections of the bloodstream and internal organs in vulnerable patients. Some GBS strains are known to physically interact with Ca in its hyphal, filamentous form, and there is evidence of synergistic interactions between GBS and Ca in colonization of the vaginal tract. In this study, the effect of co-culture of GBS and Ca on the efficacy of the antifungal fluconazole was investigated. When GBS was added to a co-culture of Ca that was treated with fluconazole in a nutrient-rich environment, there was a ~4.8 fold decrease in Ca growth compared to an individual culture of Ca with the same treatment. This effect was not observed in a nutrient-poor environment. These results demonstrated that the presence of GBS can have a positive impact on the efficacy of antifungal treatments of Ca. Conversely, presence of Ca increased GBS growth in a nutrient-poor environment, with a ~4.2 fold increase in GBS growth with Ca present compared to GBS cultured alone. As GBS and Ca both colonize the vaginal tract, the effect of antifungals on Ca growth in the presence of GBS and synergistic associations between GBS and Ca have important implications for the effective treatment of disease involving these pathogens.

1072. Abstract Withdrawn

1073. Reusable Cloud-Based Bioinformatics Analysis Environments to Enhance Data Science

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Steven Allers Benjamin King

Faculty Mentor: Benjamin King

Abstract: Widespread application of high-throughput DNA sequencing in biomedical research generates increasingly large datasets that require substantial computational resources to store the data and run bioinformatics analysis workflows. A major obstacle for many researchers is having access to bioinformatics analysis environments that are tailored to their research. Cloud-based computing and data storage resources provide one potential solution as individual researchers can build and run their own resources with lower cost of maintenance and rapidly scale the resources based on needs. We have created a reusable cloud-based bioinformatics analysis environment for a RNA sequencing analysis workflow, and provide reusable training material on how to use this workflow. The workflow consists of retrieving FASTQ files, read diagnostic analysis and trimming, aligning reads, and generating read counts per gene. The analysis workflow was implemented using SnakeMake where steps are run sequentially based on a set of rules. We have also made a tutorial on using the R/DESeq2 package to analyze the read counts and generate a list of differentially expressed genes. The workflow and training materials are designed to complement bioinformatics training courses offered by the Maine INBRE program where course participants have difficulty recreating the computing environment needed to run those workflows once they return to their home institutions. This proposal addresses these difficulties by providing resources and training to create cloud-based computing environments for biomedical research that uses bioinformatics tools. Our project may serve as a model to successfully broaden the application of bioinformatics among INBRE and other IDeA programs nationwide.

1074. Low Dose Arsenic Exposure and miR-199 Dysregulation Alters the Innate Immune Response to *Pseudomonas aeruginosa* Infection in Zebrafish.

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Liz Saavedra Brandy Soos Carol Kim Benjamin L. King

Faculty Mentor: Benjamin King

Abstract: The innate immune system functions to prevent infection and respond to injury. Innate immune function can be altered by perturbing gene function and through exposure to environmental toxicants, such as low-dose arsenic. Decreased innate immune function reduces the capacity to combat opportunistic pathogens, such as Pseudomonas aeruginosa (PA14). However, these mechanisms are poorly understood. MicroRNAs (miRNAs) are regulatory RNAs with demonstrated roles in immune function. The zebrafish can be used to investigate how arsenic and miRNA dysregulation disrupts the innate immune response to PA14 infection. Low-dose arsenic exposure was shown to inhibit the immune response in zebrafish. A prior study of PA14 infection in zebrafish demonstrated that miR-199 regulated neutrophil migration. We hypothesize that low-dose arsenic exposure disrupts the regulation of miR-199 and other miRNAs during PA14 infection. We profiled miRNA expression in 48 hours post-fertilization embryos infected with and without PA14 at 6 and 18 hours post-infection (hpi) following exposure to 0, 2, and 10 ppb arsenic. The largest number of differentially expressed microRNAs in response to infection at 6 and 18 hpi were in embryos exposed to 2 ppb arsenic with 81 and 87 microRNAs, respectively. MiR-199 was upregulated in response to infection at 6 hpi but downregulated at 18 hpi. Using Tg(lyzC:miR-199-3-Dendra2)pu19 zebrafish, neutrophil-specific miR-199 overexpression improved survival during systemic PA14 infection in embryos exposed to 2 ppb and 10 ppb arsenic. Ongoing survival and bacterial burden assays and confocal imaging will provide new insight into innate immunity and the toxicological effects of arsenic.

1075. Alkaline Phosphatase Deficiency Leads to Decreases in Adipogenesis and Mitochondrial Function

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Victoria DeMambro Samantha Costa Jennifer Daruzska Clifford Rosen Anyonya Guntur

Faculty Mentor: Anyonya Guntur

Abstract: Hypophosphatasia (HPP) is caused by loss of function mutations in the tissue-nonspecific alkaline phosphatase (TNAP) gene (Alpl) which results in rickets, osteomalacia, bone fragility and lean body mass in severe childhood forms [1]. In vitro, human TNAP positive stromal vascular fraction (SVF) cells have higher adipogenesis and mitochondrial respiration, while inhibition of TNAP decreases lipid accumulation [2-4]. To further delineate the role of TNAP in adipogenesis and mitochondrial function our lab is utilizing a global AlplKO model. AlplKO and control pups were collected at postnatal D9, weighed and inguinal white adipose tissue (IWAT) depots collected for histology as well as in vitro analysis of adipogenesis and mitochondrial function utilizing the XF96 Seahorse analyzer. AlplKO pups weighed less than controls at D9 (p<0.0001). Isolated AlpIKO IWAT depots weighed less (p<0.0001) and exhibited smaller adipocyte size vs. controls (p=0.01). In vitro, IWAT-SVF cells from our AlplKO mice exhibited reduced oil red staining at D8 of adipogenic differentiation (p< 0.0001) despite similar crystal violet staining coupled with downregulation of several key adipogenic genes including Pparg (p < 0.0001) and Cebpa (p < 0.0001). Seahorse analysis at D0 and D8 of differentiation revealed significantly lower mitochondrial respiration (D0, D9: p< 0.0001) and ATP production rates (D0: p=0.005; D9: p= 0.0006) suggesting defects in mitochondrial function in cells lacking TNAP. Studies are ongoing to test our hypothesis that the lack of TNAP in adipocyte progenitor cells leads to a decrease in adipogenic differentiation and lipid accumulation due to defects in mitochondrial dynamics and function.

1076. Altered Patient Metabolomic and Inflammatory Transcriptomics After Fasting and High Calorie Diet in Bone Marrow Adipocytes

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Samantha Costa Gisela Pachón-Peña Julie Dragon Scott Tighe Calvin Vary Heather Campbell Clifford Rosen

Faculty Mentor: Clifford Rosen

Abstract: The development of bone marrow adipose tissue (BMAT) is a normal physiological process and arguably of importance in regulating energy expenditure and metabolism. However, extensive BMAT accumulation that occurs in obesity and calorie restriction/anorexia, suggests aberrant BMAT formation has pathological implications. The present study aims to assess the dynamics of bone marrow (BM) metabolism in response to a 10-day high calorie diet (HCD) followed by a 10-day fasting protocol. BM adipocytes (BMAds) and BM sera were collected at baseline and on the final day of each diet protocol, respectively. Comprehensive and integrated analyses were used; RNA-sequencing, proteomics, and lipidomics. RNA-sequencing of HCD BMAd differentially expressed genes (DEGs) showed an upregulation of FOXP3, the transcription factor that controls the development of regulatory T-cells. In comparison, fasting BMAd DEGs showed an upregulation of CFD (Adipsin) and CFH, which are part of the alternative pathway. Proteomic analysis of HCD BM sera showed a significant (p<0.05) upregulation of ZA2G, which stimulates lipid degradation. While fasting BM sera revealed significantly downregulated proteins pertaining to B-cell production/regulation. To investigate the underlying mechanism for adipogenesis, we performed lipidomic analyses of BM sera. The results showed lipid droplet biogenesis/storage was downregulated after HCD (p=0.00325;

FDR=0.0109) but upregulated after fasting (p=0.00550; FDR= 0.0170). Overall, our findings demonstrate key differences in inflammatory response and lipid metabolism between HCD and fasting. These data support the concept that nutrient flux is an important determinant of BMAT. Further analyses are needed to understand the effects of nutrition on BM adipogenesis and immune response.
1077. Role of Non-Coding RNAs in Adaptation to Environmental Stressors Through the Study of Natural Populations

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Kayla Barton Adrienne Kovach Brian Olsen Benjamin King

Faculty Mentor: Benjamin King

Abstract: The long-term goal of our research is to understand the genomic architecture of adaptation to environmental stressors. The ability to maintain cellular homeostasis under a spectrum of stressors is critical to survival. Tidal marsh sparrow species have adapted to live in a harsh environment relative to inland species. We are studying multiple sparrow species in tidal marsh, generalist, and inland environments to determine which genes and pathways are under selection in tidal marsh populations using comparative genomics, population genomics, and transcriptomics. MicroRNAs (miRNAs) are small non-coding RNAs that regulate gene expression of target genes. The number of miRNAs in animals is proportional to increasing organismal complexity. As such, they can be used as characters to study evolution. Prior studies have examined the differences in miRNAs between broad ranges of taxa. We aim to determine whether the sets of miRNAs differ among a group of closely related species, allowing us to better understand the contemporary evolution of these species. 87 sparrow chicks were opportunistically sampled across six coastal Maine and New Hampshire field sites. We developed a protocol for extracting RNA from chicks, extracted RNA, and small RNA sequencing is currently underway for 12 samples from Nelson's, Saltmarsh, Savannah, and hybrid Nelson's/Saltmarsh species. In addition we are building a genomic analysis pipeline to build a Genotyping-in-Thousands by sequencing (GT-seq) panel that will be used to study sequence variation among miRNA and other loci. To our knowledge, our study is the first to examine the evolution of miRNAs among these species.

1078. GPCR-directed Septin Structures Are Mediated by Cdc42 GAPs and Epsins

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Cory Johnson Andrew Hart Sarah G. Latario Joshua B. Kelley

Faculty Mentor: Joshua B. Kelley

Abstract: Yeast mating utilizes a GPCR signaling pathway to initiate a MAPK cascade and Cdc42-mediated polarization of the actin cytoskeleton to facilitate the growth of a mating projection, or "Shmoo." Proper receptor-induced morphogenesis includes septin structure formation at the base of the mating projection, peripheral to the leading edge. Septin localization is disrupted when pathway desensitization by the RGS is defective. The GPCR-driven signaling mechanisms that direct septins to organize proximal to the leading edge and that tie this to $G\alpha$ desensitization are not understood. Septin deposition is known to be controlled by Cdc42 GAP activity. Therefore, we deleted each of the three Cdc42 GAPs in yeast expressing a hyperactive Ga mutant. We found that deletion of either BEM3 or RGA2 rescued septin distribution. Additionally, Cdc42 GAPs are thought to help release septin from the Cdc42 effector proteins Gic1 and Gic2. We next examined if either Gic contributed to Ga-directed septin organization and found that cells lacking GIC1 rescued septin distribution. The endocytic adapter proteins called epsins are known to both bind Cdc42 GAPs and influence septin organization. We therefore deleted either ENT1 or ENT2 and evaluated septin distribution. We found that deletion of either epsin rescued septin organization. Given epsins' role in endocytosis, we conclude that pheromone-induced septin distribution peripheral to the mating projection is likely controlled through endocytic cargoes recruiting epsins. Since these deletions are expected to slow septin structure formation, we propose that hyperactive Ga increases endocytic rate of one or multiple cargoes, leading to septin misplacement.

1079. Defining the Role of RAB27a in Vascular Contractility

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Ashley Soucy Anne Harrington Larisa Ryzhova Benjamin Tero Abby Kaija Lucy Liaw

Faculty Mentor: Lucy Liaw

Abstract: RAB27a, a member of the Ras-related protein family, is a trafficking protein that regulates exosome formation and secretion. Dysregulation of exosome secretion has been linked to various diseases including type II diabetes and atherosclerosis. However, the importance of RAB27a in regulating exosome-mediated communication within the vascular microenvironment has yet to be determined. We have established that RAB27a is endogenously expressed in three major cell types that comprise the vascular microenvironment: adipocytes, vascular smooth muscle cells, and endothelial cells. These adipocytes constitute the specialized adipose depot known as the perivascular adipose tissue (PVAT). It is known that PVAT increases the secretion of inflammatory and contractile factors during obesity, which can be detrimental to vascular function. Interestingly we found RAB27a levels increased in PVAT of mice with diet-induced obesity, suggesting the protein might contribute to secretory changes that increase vasoconstriction. Therefore, we hypothesize that loss of RAB27a will reduce vascular contractility during diet-induced obesity.

To test our hypothesis, we created a novel Rab27a global knockout (null) mouse on a C57BL6/J background. Characterization of this strain showed no changes in development compared to wildtype mice. Additionally, lipid accumulation and thoracic aorta area were quantified to evaluate for physiological changes. Proteomic analysis of PVAT and thoracic aorta suggest changes in contractility capabilities in the null mice with aging. Results were confirmed through wire myography methods. With this study, we show that RAB27a is important for vascular

function and deserves further investigation to understand the impact of PVAT-specific loss on vascular health.

1080. An Overview of Three Biomedical Science Projects across Three Research Institutes

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Lola Holcomb Jim Coffman Ben Harrison Kerry Tucker Sue Ishaq

Faculty Mentor: Jim Coffman, Ben Harrison and Kerry Tucker, Sue Ishaq

Abstract: As a first-year PhD student in the Graduate School of Biomedical Science and Engineering, I have been tasked with completing three different laboratory rotations over this first year of study. As such, this presentation will not focus on one major project, but three unique 10-week-long projects. The first of which, completed under guidance from Dr. Jim Coffman of MDIBL, was a pilot study that investigated behavioral responses of zebrafish larvae in response to light, a stress stimulus. The second project, done under guidance from Dr. Benjamin Harrison and Dr. Kerry Tucker of UNE, used bioinformatics tools to assess whether genes involved with primary cilia, Hedgehog signaling, and/or Gli2 transcription contribute to differential expression and neuropathic pain in naive and Paciltaxel-treated mice. The third and final project, which is currently in progress, will be completed in Dr. Sue Ishaq's lab. This project will use bioinformatics tools to analyze large datasets in attempt to better understand differences in microbial ecology as a representation of social and environmental inequities. **1081.** The TAp63-dependent and -independent DNA Damage Response in Meiotically Arrested Oocytes

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Monique Mills Chihiro Emori Zachary Boucher Ewelina Bolcun-Filas

Faculty Mentor: Ewelina Bolcun-Filas

Abstract: Advancements in cancer treatments have improved patient survival rates; however, the genotoxicity of these lifesaving treatments can leave female cancer patients and survivors facing adverse reproductive health problems. Ionizing radiation (IR) is commonly used for cancer treatment. IR induces DNA double-strand breaks (DSBs) and reactive oxygen species (ROS) preferentially killing cancer cells but can kill healthy cells. In somatic cells, DSBs activate the DNA damage response (DDR) pathway, leading to CHEK2-dependent activation of TRP53. Active TRP53 induces senescence, cell cycle arrest, or apoptosis. In oocytes, CHEK2 phosphorylates and activates TA isoform of TRP63 (TAp63). TAp63 is exclusively expressed in oocytes in the ovary and its activation by even low levels of DSBs induces apoptosis before DNA repair occurs. At low-dose radiation, wildtype female mice are depleted of primordial follicles and become infertile, while TAp63-deficient females remain fertile. This suggests that TAp63 plays a major role in oocyte apoptosis after DNA damage. However, at high-dose radiation the majority of TAp63-deficient oocytes are eliminated. This suggests that oocyte apoptosis at higher levels of DNA damage involves a TAp63-independent mechanism. We hypothesized that this mechanism requires TRP53 activity. Our data supports this hypothesis as females lacking TAp63 and TRP53 activity receiving high-doses radiation retain oocyte reserve and remain fertile. We will present our progress in delineating the role of TRP53 activity in oocytes and granulosa cells after radiation. Defining mechanisms regulating TAp63 and TRP53 activity in response to cellular damage will improve our understanding of how genotoxic treatments lead to oocyte loss.

1082. Design of Neutrophil-Specific Fluorescent Reporter Constructs for Ncf1 and Nfe2l2 to Characterize The Production of Reactive Oxygen Species During Influenza Virus Infection in Zebrafish

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Samuel Weafer Brandy-Lee Soos Benjamin King

Faculty Mentor: Benjamin King

Abstract: Influenza virus is a major public health concern with an estimated 9-14 million infections per year in the US. There have been five influenza pandemics since 1889, and the 1918-1919 pandemic caused an estimated 21 million deaths. Influenza A virus (IAV) is one of four influenza serotypes and can cause severe respiratory infection and distress in affected individuals due to over-activation of the immune response. Basic research on how the innate immune system responds to influenza infection is necessary since seasonal influenza vaccines are not always effective due to virus antigenic drift and shift. Zebrafish embryos are valuable models to study the response to IAV infection in vivo. Fluorescent confocal imaging can be used to visualize how host immune cells interact with the virus. In zebrafish, IAV infection leads to a hyper-inflammatory state that includes the production of reactive oxygen species (ROS) by neutrophils. ROS function as pro-inflammatory signaling molecules and as oxidizing agents in lysosomal degradation. Production of ROS must be carefully balanced during IAV infection; it is critical to generate enough to clear infection while not causing oxidative stress and tissue damage. This balance is tightly regulated and ncf1 and nfe2l2 are two genes critical in the regulation of ROS. We are using Gateway cloning to create new fluorescent-reporter constructs for these genes that can then be used to generate new zebrafish lines to analyze gene expression patterns in vivo. These constructs are designed to express the reporter specifically in neutrophils by using the lysozyme c promoter.

1083. Fickle Finkle: One of a Kind

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Sydney Brown Seth Ashby Gavin Bressette Sophie Charles Melody Neely

Faculty Mentor: Melody Neely

Abstract: Gordonia bacteria are often found in wastewater treatment biomass where they can cause excessive foaming, inhibiting the final breakdown of the wastewater byproducts. Recently, the application of Gordonia-specific bacterial viruses, called bacteriophage, to wastewater has proven beneficial to remove the excessive foaming. Bacteriophages (phages) are diverse bacterial viruses and extremely numerous with approximately 1031 existing in nature. Therefore, increasing our knowledge of Gordonia phages will provide a greater understanding of how phage can be used to aid in wastewater treatment. Gordonia terrae was used as a host to isolate the phage Finkle from a soil sample collected in Brewer, Maine. Finkle is classified as a singleton, meaning it does not share genetic similarity with other phage that have been previously isolated. Finkle also has a temperate lifestyle, meaning it has the ability to integrate into the host cell genome. The genome of Finkle contains 47,895 base pairs with a 66.6% GC content. Annotation was performed using bioinformatic tools such as HHPRED, PECAAN, Phamerator and PhagesDB to determine gene start sites and identify protein functions. A toxin/antitoxin system, which increases bacterial fitness, was identified in the ~80 genes annotated, while 33 of the genes encode proteins with unknown function. Annotating G. terrae phage genomes increases our understanding of how phages can be used in the management of bacteria in activated sludge wastewater treatment. In addition, studying Gordonia bacteria and their phages will deepen our understanding of both the medical and environmental applications of this microbial family.

1084. Perivascular Adipose Tissue is Distinct in Two Disease Populations

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Caitlin Stieber

Lucy Liaw

Faculty Mentor: Lucy Liaw

Abstract: Background: Cardiovascular disease, which is the leading cause of death in the U.S., is tightly linked to obesity. To study this disease association, we use perivascular adipose tissue (PVAT) which surrounds most vessels and exerts a paracrine effect. We study PVAT in two patient populations: donors undergoing mitral valve repair (VR) surgery or coronary artery bypass graft (CABG). We hypothesize that due to lack of arterial disease VR donors will have a lower BMI, smaller adipocytes, and more adipocytes per area than CABG donors. Methods: PVAT was harvested from donors undergoing CABG and VR surgeries and was fixed, paraffin embedded, sectioned, and stained. Stained images were analyzed with ImageJ AdipoSoft to quantify number and size of adipocytes. Tissue samples were submitted for mass spectrometry proteomic analysis. Principle component analysis (PCA) plots were used to generate protein profiles for each sample.

Results: VR donors had a BMI of 25.43, while CABG donors had an average BMI of 31.72. In VR PVAT, there was a trend of larger and fewer adipocytes, as compared to CABG PVAT. Analysis of PVAT from additional donors is ongoing. Lastly, PCA analysis showed that VR PVAT and CABG PVAT have distinct proteomic profiles.

Conclusions: VR and CABG PVAT display unique features, both in donor demographics and at a molecular level. Our pilot analysis of adipocyte morphology suggests that PVAT from CABG donors may have more proliferative pre-adipocytes, leading to more cells of smaller size. This possibility will be assessed in future experiments, and we will further consider potential protein PVAT biomarkers of cardiovascular disease.

1085. Investigating the Interaction of *Streptococcus agalactiae* and *Candida albicans* in Vitro and in Vivo

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Kathryn Patenaude Anna Lane Robert T. Wheeler Melody N. Neely

Faculty Mentor: Melody N. Neely

Abstract: Treatment of opportunistic infections can be problematic because of a lack of understanding of how other organisms found in the localized environment play a role in the progression of infection. One factor that has been poorly studied is how bacteria and fungi interact together in the host, and how that may be influencing virulence. Both the fungus Candida albicans (C.a.) and the bacteria Streptococcus agalactiae (Group B Strep or GBS) are commensals that colonize the vaginal tract. While usually harmless in the human host, both organisms can cause opportunistic infections in immunocompromised patients, which can also progress to co-infections. What we don't understand is how interactions between these organisms can affect the progression of infections caused by each pathogen or how they affect treatment outcomes. Previous in vitro work has analyzed interactions between other commensal bacteria and C.a., but there is not much known about how GBS and C.a. interact in co-infections and what influence that interaction may have on the effectiveness of current treatments. Research to date has revealed that C.a. can increase growth of GBS in vitro in nutrient poor media, even in the presence of antibiotics. Increased virulence during a co-infection in zebrafish larvae is observed suggesting a synergistic effect in vivo. Fluorescent microscopy also reveals increased growth and survival of C.a. in vivo during a coinfection compared to a solo infection. These data are highly relevant to treatment of human infections caused by these organisms as they are often found co-colonizing the same tissue environment.

1086. Anti-Inflammatory Effect(s) of Phenolic Extract from Wild Blueberries in Wound Healing

Submission Type: Virtual Presentation

Submission Category: Biomedical Sciences

Author(s):

Tolu Esther Adekeye Natalie VandenAkker Tyla Greenlaw Dorothy Klimis-Zacas

Faculty Mentor: Dorothy Klimis-Zacas

Abstract: Chronic wound care costs billions of dollars annually. Unresolved inflammation is a major factor that hinders healing of chronic wounds. Thus, there is a need to develop anti-inflammatory wound healing products. Polyphenols have been reported to improve wound healing. Thus, the objectives of this study are to examine the pre-clinical effect of a phenolic extract (PE) from wild blueberries (WB) on wound healing in rats. Phenolics were extracted from WB through the Folin-Ciocalteu method. The extract was incorporated into a gel and cream. Fifty-six Sprague-Dawley rats were classified into seven groups as: 1. Control (no treatment), 2. the cream carrier without the PE, 3. gel carrier without PE, 4. gel with 500 µg/ml of the PE, 5. cream with 500 µg/ml of PE, 6. gel with 1000 µg/ml of PE, and 7. cream with 1000 µg/ml of PE. Dorsal wounds were created on all the rats and treated according to the above groups for six days. Skin tissues were excised for histological analysis. Stained tissues were scanned with the light microscope and immune cells (neutrophils) were counted using Qu path software. Our analysis showed a decrease in the presence of inflammation with the gel-PE 500 µg/ml treatment compared with the other groups. Currently, we are analyzing proteins associated with the observed decrease in inflammation. Results from this project may benefit patients with chronic wounds and promote economic growth for wild blueberry farmers and the State of Maine.

1087. Rapgef Family Members Contribute To Erk Activation by Gs-coupled Receptors In Mouse Dorsal Root Ganglion Neurons

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Zaid Al-Abbasi Derek Molliver Ramaz Geguchadze

Faculty Mentor: Derek Molliver

Abstract: Rap guanine nucleotide exchange factor (Rapgef) family members activate Rap/Ras signaling pathways by exchanging GTP for GDP. Four of the 6 Rapgefs have been identified as effectors of cAMP signaling. ERK signaling is required for some components of nociceptor sensitization, therefore cAMP signaling to ERK may represent a critical pathway in the induction of inflammatory hyperalgesia by Gs-coupled receptors (GsPCRs). Studies in heterologous systems suggest that activation of ERK downstream of GsPCRs is mediated by Rapgef2, either alone or in combination with PKA. In dorsal root ganglion (DRG) sensory neurons, phosphoproteomics analysis showed that Rapgef2 was amongst the top affected proteins during inflammation. All Rapgefs are expressed in DRG to varying degrees. Next, we examined the relative contributions of PKA and Rapgef2 in the activation (phosphorylation) of ERK (pERK) downstream of cAMP. Application of the cAMP analog 8-Br-cAMP to dissociated DRG neurons induced pERK. Consistently, the Rapgef2-selective cAMP analog N6-Phe-cAMP also showed a dose-dependent (150-1000 μ M) induction of pERK that was reversed by a Rapgef2 inhibitor, but not by PKA inhibitor H89, supporting selective activation of Erk by Rapgef2. Next, we examined whether endogenous Gs-coupled receptors induce pERK. RNA levels for β -adrenergic receptors Adrb1-3 and dopamine receptors Drd1, 5 were examined by quantitative PCR in mouse DRG neurons and a human DRG-derived cell line (HD10.6 cells). Adrenergic and dopaminergic agonists induced substantial pERK. These results provide evidence that GsPCRs activate ERK through Rapgef2 in DRG neurons.

1088. NOD/ShiLtJ Strain: A Mouse Model to Investigate the Regulation of Fetal Oocyte Attrition.

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Rose Besen-McNally Ruby Boateng Nathaniel Boechat Ewelina Bolcun-Filas

Faculty Mentor: Ewelina Bolcun-Filas

Abstract: In humans and mice, the ovarian reserve (OR) is established during a lengthy process that starts during early embryogenesis with germ cell specification and culminates in the first weeks after birth when primordial follicles (PF) are formed. OR establishment is an important process whereby the fertile lifespan of the female is established, and the OR determines not only how long ovaries will produce oocytes for fertilization but also the onset of menopause in humans. Fetal oocyte attrition (FOA) has been identified as a critical developmental event that regulates how many oocytes survive and contribute to the final OR. In addition to FOA, OR size and quality also depend on efficiency of meiotic recombination; chromosome asynapsis and unresolved double-strand breaks (DSB) lead to the exclusion of defective oocytes from the final OR by a checkpoint mechanism. There is limited understanding of how genetic factors modify these mechanisms that determine the OR. However, LINE-1 retrotransposon elements have previously been identified as playing a critical role in FOA in C57Bl/6 (B6) female mice. Retrotransposon elements are capable of excision and subsequent insertion anywhere in the genome, events that can cause DSBs, insertional mutagenesis, and affect expression of genes near insertion sites. The exact mechanism by which LINE-1 activity affects the OR remains unclear and has not been investigated in genetic backgrounds other than B6. High levels of LINE-1 expression are thought to cause additional DSBs during meiotic recombination and negatively affect oocyte survival. We hypothesized that mouse strains with large OR might exhibit oocyte evasion of FOA and/or quality checkpoint. As one instance of this, we found that NOD/ShiLt females have a larger and higher quality OR compared to the standard inbred B6

strain. Here we show greater oocyte survival in the FOA window of elimination in NOD/ShiLtJ than in B6 ovaries. To investigate one possible cause of FOA evasion, we determined LINE-1 expression levels in ovaries during prenatal stages, finding lower overall levels in NOD/ShiLtJ than in B6 ovaries. These observations support a role for LINE-1 as a regulator of OR size in mice and identify the NOD/ShiLtJ strain as a good model to investigate regulation of FOA and LINE-1 activity in female germline. Supported by R01 HD093778.

1089. Uncovering Candida albicans Factors that Modulate the Host Phagocyte Response

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Bailey Blair Emma Bragdon Robert Wheeler

Faculty Mentor: Robert Wheeler

Abstract: Candida albicans is the 4th most common blood stream infection found in US hospitals. The first line of defense against these infections, is the innate immune system. Previous work using the larval zebrafish suggests that early immune response is critical in controlling C. albicans infection as a strong early phagocyte response promotes survival. However, is has been seen that C. albicans has strategies to evade the host immune system. Evidence suggests that the ability to transition from yeast to hyphal growth may facilitate immune evasion by limiting early phagocyte recruitment and uptake of *Candida albicans*. However, the mechanism by which C. albicans achieves this is unknown. To uncover factors important in innate immune evasion we utilized the transparent larval zebrafish infection model to screen C. albicans mutants for altered virulence and immune response. This screen identified 11 mutants that had greatly attenuated virulence, some of which also show an altered immune response. We saw that RBT1, which codes for a fungal cell wall protein and secreted peptides, plays a role in limiting neutrophil recruitment to the site of infection. On the other hand, lipases seem to play a role in limiting containment of fungi. Our results highlight the different mechanisms C. albicans employs to overcome the host immune system. This work will provide valuable insight how C. albicans limits recruitment of phagocytes as well as uptake by these cells, allowing it to escape destruction by the host immune system.

1090. Combining Regional Cell Composition Estimates with Bulk RNA Sequencing Allows for Refined Detection of Cell-Type-Specific Genetic Associations

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Brianna Gurdon Niran Hadad Maria Telpoukhovskaia Sharon Yates Jan Bjaalie Catherine Kaczorowski

Faculty Mentor: Catherine Kaczorowski

Abstract In addition to aging, strong genetic components have been associated with Alzheimer's disease(AD) progression. Bulk RNA-sequencing is often used to detect transcriptomic differences that occur with age and AD; however, these methods can be influenced by changes in cell composition, which can then confound differential gene expression analyses. By incorporating cell-type proportion estimates measured using immunohistochemistry(IHC) with bulk RNAseq data, we can correlate cell composition with gene expression and performed gene set enrichment analyses to better understand the biological pathways implicated with disease progression.

The QUINT workflow was used to quantify neurodegeneration(NeuN), gliosis(Iba1&Gfap), and amyloid pathology(A β 1-42) in hemibrains of 40 mice from the AD-BXD genetic reference panel. This cell composition data was then integrated with bulk RNAseq data to correlate strain averages of gene expression to individual hippocampal and prefrontal cortex cell coverage.

There is an increase in Gfap and Iba1-positive cells, and A β 1-42 pathology, in middle-aged(14m), compared to adult(6m) mice. Gene expression correlated with glial load is highly enriched for pathways predominately in the immune system category. When specifically correlating hippocampal glial cell load with disease-associated microglial and astrocyte marker

genes, there were a number of significant correlations(p<0.05) at the adult timepoint (including Clu, Ctsb, Ctsl).

Seeing that differences in gene expression are indeed related to cell composition, previous findings nominating enriched pathways based on bulk differential gene expression alone may be misrepresented. In the future, cell composition can be included as a covariate in analyses of bulk gene expression to increase the power to identify cell-type-specific genetic associations.

1091. Influenza A Virus Infections Measured by Respiratory Burst Assay

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Brandy-Lee A. Soos Alec Ballinger Mykayla Weinstein Benjamin L. King

Faculty Mentor: Benjamin L. King

Abstract: Influenza A virus (IAV) is a major health concern since it can cause severe lung infections. The innate immune system is the host's first defense against pathogens, including IAV. The innate immune system consists of multiple cells including neutrophils and macrophages. Neutrophils are phagocytes that engulf and destroy pathogens through the production of reactive oxygen species (ROS). The production and release of ROS is a process called the respiratory burst response that begins with NADPH oxidase (NOX). Because ROS is highly reactive, levels must be tightly controlled to limit host tissue damage. The long-term goal of our research is to learn how to balance the respiratory burst response following IAV infection. Using a zebrafish model of IAV infection, our preliminary studies show that limiting ROS production improves survival. We hypothesize that reducing the respiratory burst response will limit tissue damage and improve survival. To test this hypothesis, a respiratory burst assay is used to measure the respiratory burst capacity. First, ROS is induced using phorbol myristate acetate and then ROS levels are measured. In these assays, we measure the amount of a fluorescent product, dichlorofluorescein, that is generated when ROS oxidases 2,7-dihydrochlorofluorscein diacetate. Ongoing studies have shown that the respiratory burst response decreases by 48 hours post infection and gradually rebounds over the course of infection. We are currently measuring changes in the respiratory burst response with and without the NOX inhibitor, GSK205739. These studies will help identify the molecular mechanisms that regulate the respiratory burst response.

1092. Characterization of the Polymorphic Toxin System in Mycobacterium Prophage McProf

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Xuyang Gu Sarah McCallister Jaycee Cushman Anna Schumann Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: Non-tuberculosis mycobacteria such as Mycobacterium abscessus are emerging pathogens of immunocompromised patients. M. abscessus isolates are often multi- or totally drug resistant and are a major public health threat. Understanding the mechanisms of antibiotic resistance is crucial to improve treatments. The majority of M. abscessus isolates carry one or more prophages, integrated viral genomes, that are enriched in toxin genes and predicted to play a role in virulence. The Molloy lab recently demonstrated that prophages in the related pathogen M. chelonae increase mycobacterial antibiotic resistance. A polymorphic toxin system encoded by the prophage McProf appears to play a role in the increased antibiotic resistance. The toxin system includes three genes that encode an ESAT6-like protein (gp99), a polymorphic toxin (gp98) and a cognate immunity protein (gp97) but the function of these genes has not yet been characterized. The toxin system is hypothesized to play a role in antagonistic interactions with non-toxin producing cells and cell signaling with other toxin-producing cells. In this study, we will confirm that the toxin system has toxic activities and facilitates antagonistic interactions with non-toxin producing bacteria. The toxin system genes will be cloned into mycobacterial vectors with either inducible or constitutive promoters. The toxin will be tested for toxic activities in cells that encode the toxin with and without the immunity protein gene and measuring cell density after induction. We will determine if the toxin producing cells are antagonistic against cells that don't produce the corresponding immunity proteins in co-culture experiments.

1093. Toxicity of Lanthanide Series Rare Earth Elements in Caenorhabditis elegans

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Michael Croft Jennifer Newell-Caito

Faculty Mentor: Jennifer Newell-Caito

Abstract: The production of rare earth elements (REEs) in the last 20 years has significantly increased, due to the use of REEs within a variety of applications such as fiber optics, batteries, medicines, and purifications. Over 99% of these elements accumulate in landfills and subsequently pollute local ecosystems. Although the toxicity of these metals is assumed to be low, their increased use and lack of long-term studies requires further investigation. These metals have been shown to cross biological barriers and bioaccumulate. The nematode Caenorhabditis elegans has been used in a variety of toxicity studies; their short lifespan and high homology to humans make them ideal for biological monitoring of toxins. Therefore, we hypothesized that C. elegans exposed to REEs would have altered survival and lifespan parameters. We selected four commonly used lanthanide series metals for investigation, lanthanum (La), cerium (Ce), erbium (Er), and ytterbium (Yb). Dose-response survival curves found that the C. elegans were highly sensitive to Ce, followed by Yb, Er, and La. The LD50 values were 1.12 ± 0.076 mM, $1.52 \pm$ 0.116 mM, 1.42 ± 0.268 mM, and 17.1 ± 0.057 mM, respectively. In addition to survival curve analysis, lifespan and reproductive success analysis were performed, showing significant differences between the metals. These findings demonstrate detrimental effects of chronic exposure to lanthanide metals in nematodes. Our results suggest that similar effects may be occurring ecologically at electronic waste disposal and mining sites, with implications for human health.

1094. Screen to Find Regulators of *Candida albicans* Drug Tolerance During Co-cultures with *Pseudomonas aeruginosa*

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Nikhil Vaidya Siham Hattab Robert T. Wheeler

Faculty Mentor: Robert T. Wheeler

Abstract: Candida albicans is an opportunistic pathogen that can cause invasive systemic infections in immunocompromised patients-with 40% mortality. C. albicans is commonly isolated from co-infections with the bacterium Pseudomonas aeruginosa, which is the most prevalent pathogen in cystic fibrosis and mechanically ventilated patients, together forming persistent biofilms on catheters and implants. Treatments for these polymicrobial infections are challenging, as interactions between organisms and how they affect drug efficacy are not well understood. The antifungal drug fluconazole (FLC) is a primary treatment for candidiasis, yet C. albicans exhibits multiple FLC resistance mechanisms. Interestingly, recently published work has shown that C. albicans loses drug tolerance and exhibits higher susceptibility to FLC during co-cultures with *P. aeruginosa*. To understand how this drug-bacterial combination works against C. albicans, we are conducting a genetic screen for negative regulators of FLC tolerance in C. albicans during in vitro co-cultures with P. aeruginosa. We will screen a library of 600+ homozygous single gene mutants of C. albicans grown together with P. aeruginosa and FLC and will identify mutants with increased survival in the presence of P. aeruginosa and FLC. A secondary screen will be performed in mutants with increased survival to investigate whether the increased survival was due to increased FLC resistance or increased tolerance to the combination of P. aeruginosa and FLC. Investigating single gene deletions may elucidate pathways mediating the interaction between the two organisms, opening possibilities of new drug targets for treatment.

1095. Investigating the Sexually Dimorphic Role of Corticotropin-Releasing Hormone in Neonatal Trauma-Induced Pain-Vulnerability

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Megan Tomasch

Mike Burman

Faculty Mentor: Mike Burman

Abstract: Neonatal intensive care units (NICUs) provide life-saving care for preterm and sick neonates, but many of these procedures are painful and stress-inducing. Neonatal medical trauma results in an increased susceptibility to chronic pain, anxiety disorders, and depression, that manifests in later life following a subsequent injury or psychological stressor. Using a "2-hit model" of juvenile pain vulnerability, our lab has successfully modeled this in rats. To accomplish this, we subjected male and female neonatal rats to a common NICU manipulation (e.g., painful needle-prickings from PD 1 to PD 7), followed by a second, activating, injury or stressor (e.g., foot shock) on PD 23, and observed a tactile hypersensitivity in both sexes. Although the neurobiological mechanisms remain unclear, cells expressing corticotropin releasing factor (CRF+ cells) have been implicated in a sexually dimorphic manner. In males, but not females, pain-vulnerability is associated with alterations to CRF cells in the central amygdala (CeA). Females must then utilize a different mechanism, and CRF cells of the hypothalamus—specifically the paraventricular nucleus (PVN) of the hypothalamus—are a likely candidate, as neonatal trauma leads to sex differences in hypothalamic activation and changes CORT expression in females. We hypothesize that the immediate and lasting consequences of neonatal trauma result from changes to CRF+ cells in the CeA and PVN, including altered synaptic transmission and intrinsic excitability. To test this hypothesis, we will implement chemo- and optogenetic manipulations of CRF cells in the CeA and PVN both behaviorally (in vivo) and electrophysiologically (ex vivo slice preparation).

1096. Integrating Molecular Profiles with Clinical Outcomes in Cancer Patients from Rural Maine

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Michael Babcock

Benjamin King

Faculty Mentor: Benjamin King

Abstract: Colon cancer is the second most deadly cancer and symptoms do not manifest until tumors are in advanced stages and despite diagnostic advancements and new treatment regimens, patient survival rates remain low. Molecular profiling reveals a large amount of genomic data during colon cancer subtyping; however not all findings are incorporated for patient clinical management. Many additional mutations occur in crucial biological pathways known to be dysregulated in colorectal tumors. In a previous study, we found that established prognostic/therapeutic markers and additional molecular features correlate with lung cancer patient outcomes. We propose that a similar stratification model can be used to classify colorectal adenocarcinoma patients to improve prognostic/therapeutic outcome. Clinical pathology data from colon cancer patient tumor specimens were analyzed for mismatch repair deficiency, microsatellite instability status, and genomic profiles. Findings were integrated with clinicopathological data using standard R software. Principal component analysis classified mutational patterns. Categorical relationships were performed by pairwise association studies using Chi-square and Fisher's exact tests. Kaplan-Meier survival curves demonstrated the prognostic value of new categorical classifications. Integration of clinical pathology and molecular profiling data of colorectal tumors from rural Maine cancer patients were compared with the literature. The identification of a novel colon cancer molecular classification could be used to improve patient outcomes.

1097. Integrin and Dystroglycan Protein Localization in Muscle Cell Membranes in Dystroglycan and Dystroglycanopathy Mutants

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Mary Astumian Prakash Raut Clarissa Henry

Faculty Mentor: Clarissa Henry

Abstract: Dystroglycanopathies are progressive diseases that vary in severity and affect muscle and neurological health. The transmembrane proteins dystroglycan and integrin, link the actin cytoskeleton inside the muscle cell to extracellular matrix (ECM) outside the cell maintaining cellular attachments. To function properly, integrins need to cluster in the muscle cell membrane and dystroglycan needs to be glycosylated. Several zebrafish models of the human dystroglycanopathies and mutations of dystroglycan and integrin have been created. Both dystroglycan and integrin bind to the ECM protein laminin. Laminin deposition and muscle health in zebrafish dystroglycan mutants and integrin-alpha7 mutants improved after oxidized nicotinamide adenine dinucleotide (NAD+) treatment. But NAD+ did not improve muscle health in the one dystroglycan glycosylation mutant tested so far. To explain the lack of improvement, one hypothesis is that hypoglycosylated dystroglycan protein physically interferes with integrin clustering in the membrane, preventing normal integrin-ECM binding activity. The localization of dystroglycan and integrin proteins relative to each other at the muscle cell membrane is hypothesized to be important and will be measured using both confocal and superresolution microscopy. NAD+ treated versus untreated zebrafish will be analyzed to assess the average distance between the molecules of dystroglycan and integrin-alpha7 at the myofiber membranes.

1098. Veterinary Immersion Network

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Zachary Inniss Anne Lichtenwalner

Faculty Mentor: Anne Lichtenwalner

Abstract: Coming to UMaine, I was under the impression that the vast majority of the people in my major had the same opportunities in exploring veterinary medicine. But I was wrong. Many of my classmates do not have any vet hours for many different reasons, such as difficult accessibility. For example, there are more emergency hospitals in a 20-mile radius from where I live than in the entire state of Maine. Another factor that proves challenging in gaining veterinary experience is that the veterinarians in their area are unwilling to take these students on because the students lack experience. Feeling defeated due to the lack of support and opportunities, many students see no other option but to change career paths. A potential solution to this complex problem is the creation of The Veterinary Immersion Network. I hypothesize that the Veterinary Immersion Network will help students gain well-rounded experience and solidify their career choice in the veterinary field. The Veterinary Immersion Network's goal is to provide insight, opportunity, and support to anyone interested in veterinary medicine. We can achieve this goal by creating a website where veterinarians can interact with students aspiring to become the next generation. When students access the site, they receive access to resources like testimonials and interviews from different veterinary professionals, modules to learn fundamental clinical skills for employment /volunteer/internships, and a support system of peers that share a love of animals.

1099. CTHRC1 Suppresses Adipogenesis and Modulates Lipid Composition

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Matthew Siviski Igor Prudovsky

Faculty Mentor: Igor Prudovsky

Abstract: The development of novel approaches to prevent obesity is imperative given that 2016 marked the first year in decades that the life expectancy for adults in the United States decreased, largely due to a rise in obesity-related comorbidities. The secreted factor, collagen triple helix repeat-containing 1 (CTHRC1), is a novel suppressor of white adipose tissue formation (adipogenesis). In order to elucidate the molecular mechanisms by which CTHRC1 suppresses adipogenesis, we have developed an in vitro model to study the effects of CTHRC1 on the expression levels of the adipogenic transcription factors that coordinate preadipocyte-to-adipocyte differentiation. Our data show that CTHRC1 suppresses both the transcript (mRNA) and protein expression levels of CCAAT/enhancer-binding protein delta $(C/EBP\delta)$, $C/EBP\alpha$, peroxisome proliferator-activated receptor gamma (PPARy), and other critical adipogenic transcription factors that give rise to a mature, lipid-rich adipocyte. In this context, our data suggest that CTHRC1 may function in part by increasing the expression of SRY protein box 9 (SOX9), a protein that suppresses adipogenesis by inhibiting the promoter regions of C/EBP β/δ and their corresponding gene expression. Moreover, comparative mass spectrometry analysis of the lipid composition of subcutaneous and visceral adipose tissue depots reveals significantly increased levels of unsaturated, 18-carbon fatty acyl triglyceride species (i.e., "bad fat") in Cthrc1-null mice in comparison to wildtype control mice. Therefore, these data suggest there are important metabolic implications of CTHRC1 signaling given its ability to beneficially modulate triglyceride composition in vivo. Collectively, our results show that CTHRC1 is both a novel suppressor of white adipogenesis and unsaturated long-chain fatty acid triglyceride levels, and thus may possess the potential to be utilized for the design of future, efficacious therapies to combat the obesity epidemic and obesity-related comorbidities.

1100. Notch Signaling Regulates PVAT Function During Diet-induced Obesity

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Chenhao Yang Anne E. Harrington Larisa M. Ryzhova Lucy Liaw

Faculty Mentor: Lucy Liaw

Abstract: Obesity is an established risk factor for cardiovascular diseases (CVD) and possibly shares molecular and cellular disease mechanisms as CVD. As a component of the vasculature, perivascular adipose tissue (PVAT) is as a critical regulator of vascular function due to its anatomical proximity to the vascular wall. In addition to a broad role in embryonic development, Notch/Rbp-jk signaling plays a crucial role in regulating metabolic homeostasis. Suppression of Notch signaling components was reported to induce beige phenotypes within white adipose tissue. We studied how Notch/Rbp-jk signaling and potential downstream pathways regulate PVAT phenotype. We generated mouse models with adipose tissue specific knockout of Rbpj genes or overexpression of Notch intracellular domain using Adipoq-Cre driver and examined their physiology, histology, and expression of metabolic and vascular relaxation pathway components as compared to control non-Cre mice. Our data showed that Notch signaling was activated in PVAT during high fat diet (HFD) treatment. Expression of Notch signaling component including RBPJ-k was increased during differentiation of PVAT. Moreover, PVAT from adipocyte-specific RBPJ-k conditional null mice showed alterations in the vasorelaxation pathway including eNOS, with a potential link through PI3/AKT signaling. Results of vessel wire myography experiment further confirms the influence of Notch signaling in PVAT on vascular reactivity. In summary, our studies show that Notch signaling regulates metabolic homeostasis of adipose tissue including PVAT. In addition, Notch signaling potentially regulates PVAT-mediated vasorelaxation through eNOS pathways.

1101. Electrophysiological Recordings in Humans Using a Novel Microneedle Array Device

Submission Type: Virtual Presentation Submission Category: Biomedical Sciences

Author(s):

Lydia Caron Sarrah Marcotte Leonard Kass Rosemary Smith Magdalena Blaskiewicz Kristy Townsend

Faculty Mentor: Leonard Kass

Abstract: Peripheral neuropathy is a devastating disease marked by the progressive loss of distal nerve function which starts at the skin and moves proximally, subsequently causing tingling, pain, hypoesthesia, and in some cases need for limb amputation. Earlier detection offers hope for better treatment and prevention. Neuright, Inc. has developed a novel 9 channel microneedle array device that can detect transdermal neural activity in mice in the basal state, in induced diabetic neuropathy mouse models, and now in humans in the basal state. The focus of this study was to survey and evaluate any neural activity recorded from humans using this microneedle device. The microneedle array was inserted into the lateral calf of two healthy human subjects under resting conditions and recordings were obtained for several minutes. The participants were occasionally asked to flex their toes, which marked an immediate and noticeable change in the electrophysiological recordings delivered from the array. These results showed that the microneedle array was able to record several different types and categories of electrical activity: single action potentials, patterns of action potentials, compound action potentials and electromyography from muscle (CAPs/EMGs), bursts of CAPs/EMGs, as well as train-like patterns of CAPs/EMGs. Expanding upon this method of recording from humans in the future, observable differences in the characteristics of these electrophysiological recordings may provide a diagnosis of peripheral neuropathy in diabetic patients.

Acknowledgment: We thank Julia Towne for her help in constructing the microneedle array.

1102. Bone Regeneration: Cellulose Nanofibers and Additional Composites

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Shanna Scribner Sahar Roozbahani Michael Mason

Faculty Mentor: Michael Mason

Abstract: Aging, disease, and traumatic injuries may result in weakening or loss of bone tissues. Although bone has the natural ability to regenerate for small fractures or breaks, a large loss of bone volume may require surgical interventions to replace that bone. Current surgical replacements have significant disadvantages that are pushing researchers to look in other areas for replacements, such as biomaterials. Many biomaterials have flexible properties and are biocompatible, making them ideal for implantation research. Cellulose nanofibers (CNF) are a particularly popular material, having many applications such as drug delivery, tissue engineering, and regeneration. CNF has great strength and stiffness, is light-weight, biodegradable, biocompatible, and tunable mechanical properties which make it desirable for bone scaffolding. The degree of alignment in CNF-based scaffolds positively correlates with mechanical properties as well as cell alignment, differentiation, and adhesion. In this research, unilateral elongation force is used to stretch thin CNF films on latex which has proven to provide consistent, effective results. Further testing into increasing alignment of the fibrils using other composites such as hydroxyapatite and polyethylene glycol are ongoing. **1103.** Determining Septin localization With α -Arrestin Deleted Strains of *Saccharomyces cerevisiae*

Submission Type: Poster

Submission Category: Biomedical Sciences

Author(s):

Ryan Andrick

Joshua Kelley

Faculty Mentor: Joshua Kelley

Abstract: Interactions between cells in *Saccharomyces cerevisiae* provides a model for spatial signaling through G-protein coupled receptors. These transmembrane receptors are conserved in humans and play a role in endocrine signaling, immune function, and neuron function, among others. The yeast mating pheromone binds to the Ste2 receptors, which are then bound by α -arrestins to promote ubiquitylation and endocytosis. Endocytosis of the receptor promotes the ability of the yeast to track a gradient of mating pheromone. Gradient tracking also requires the function of cytoskeletal proteins called septins, which form structures at the periphery of the mating projection. We are testing whether the yeast arrestins are required for proper septin function. First steps of determining the effects Rog1 has on septin localization are to transform yeast strains to lacking Rog1 and have fluorescently tagged septins to compare the deletion morphologies to the wild type. Determining whether septin placement is linked to the locations of endocytosis of the receptor is important for polarization and gradient tracking. Further methods to quantify this would be to fluorescently tag Ste2 as well as α -arrestins for comparing the similarity of their localization during the pheromone response.

1104. Phenolic Extract(s) from Wild Blueberries promotes Wound Re-epithelialization

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Tolu Esther Adekeye Natalie VandenAkker Loryn Porter Dorothy Klimis-Zacas

Faculty Mentor: Dorothy Klimis-Zacas

Abstract: Adequate wound re-epithelialization is important for wound healing. However, this is a challenge in chronic wounds such as diabetic and ischemic ulcers. Bioactive compounds such as phenolic (PE) and anthocyanin (ACN) fractions from Wild Blueberry (WB) have been reported to promote wound closure and angiogenesis. Thus, the objective of this study is to examine the effect of PE and ACN fractions at different concentrations on wound re-epithelization in rats. Phenolics and anthocyanin fractions were extracted from WB through the Folin-Ciocalteu method, and their composition was determined by HPLC. The extracts were resuspended in distilled water. Fifty-six Sprague-Dawley rats were classified into seven groups as follows: 1. Control (no treatment), 2. PE 250µg/dl, 3. PE 500µg/dl, 4. PE 1000µg/dl, 5. PE+ACN 250 µg/dl, 6. PE+ACN 500 µg/dl, and 7. PE+ACN 1000µg/dl. Dorsal wounds were created on all the rats and treated according to the above groups for 7 days. Skin tissues were excised and fixed for histological analysis. Tissues were stained with H&E and scanned with Olympus light microscope. Re-epithelization was measured and assessed using Qu path software. Our analysis showed adequate and discrete wound re-epithelization with PE 500 µg/dl treatment compared to the other groups. Results from this study may benefit patients with chronic wounds through the development of clinical wound healing products and will promote economic growth for wild blueberry growers and the state of Maine.

1105. Effects of Binge-Eating on Impulsivity, Compulsivity, and Reward Sensitivity Across Strain and Sex

Submission Type: Virtual Presentation

Submission Category: Engineering and Information Sciences

Author(s):

Logan Douglas Kristen O'Connell

Faculty Mentor: Kristen O'Connell

Abstract: After a break-up, maybe you eat ice cream to comfort yourself. When you finish studying for a big test, you might reward yourself with a treat. While people commonly understand eating as a metabolic need, in an age of excess, many people eat for pleasure or the positive feeling eating good food brings us. Eating for pleasure, or hedonic feeding, is less understood and well-researched compared to eating to fulfill our homeostatic needs. One poignant example of hedonic feeding is binge-eating. Binge-eating refers to the overconsumption of food in a distinct period of time (~2 hours) accompanied with dysregulation of impulsive and compulsive eating behaviors. (Hudson et al. 2007) In a mouse model, intermittent access to a high-fat or palatable food induces binge-eating behavior. The neural controls of binge-eating are thought to include not only traditional homeostatic controls of food intake and behavior like the hypothalamus but also reward-circuitry in the mesolimbic system. In part due to this existing overlap between circuits, the effect of binge-eating on substance abuse-related phenotypes such as compulsive behaviors, impulsivity, reward sensitivity, and more are of interest in the study of the effects of binge-eating on behavior. In this review, I present the established literature on how chronic and intermittent access to high-fat diet affect compulsivity/impulsivity related phenotypes and reward sensitivity in studies of addiction. This will be presented alongside a discussion of current gaps in the research and preliminary data regarding the importance of genetic diversity in evaluating motivation for palatable food reward.

1106. Gordonia Phage Periwinkle

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Abigail Dichiara Emma Boudreaux Sophie Childs Amy Handy Sam Kovacs Alison Kueck Parker Landsbergen Sally Molloy

Faculty Mentor: Sally Molloy

Abstract: Gordonia are ubiquitous Actinobacteria that are frequently isolated from soil and water but can also cause infections in immunocompromised individuals. Studying the content of Gordonia bacteriophage (a bacterial virus) genomes will help us better understand the physiology of the bacterial host and provide opportunities to improve treatment of bacterial infections in general. Using SEA-PHAGES protocol, the novel Gordonia bacteriophage Periwinkle was isolated from a manure sample collected at Roger's Farm, Orono, ME, using the host bacterium Gordonia terrae 3612. Periwinkle was characterized by plaque morphology, virion morphology, restriction endonuclease digest patterns, host range, and genetic sequencing. Periwinkle is one of 22 cluster DN temperate bacteriophages. The genome is 55,657 nucleotides long, has a GC content of 62.9%, and encodes 113 putative genes. Consistent with a temperate phage, Periwinkle encodes a tyrosine integrase (gp57) and an immunity repressor (gp58). Approximately 41% of the genes (46 genes) have no known function. The increased knowledge and identification of Gordonia bacteriophage genomes such as Periwinkle, especially the uncharacterized genes, can advance our understanding of bacterial and phage evolution.

1107. Novel Cluster CZ phage Oregano: Friend & Foe to Bacteria

Submission Type: Poster

Submission Category: Natural Sciences

Author(s):

Alexander Russell Veronica Chun Oyku Goktug Hannah Lembree Dorian Royal Annika Savage Makayla Sisco Maple Waltner

Faculty Mentor: Sally Molloy

Abstract: Antibiotic resistance is a growing threat to public health, particularly for immunocompromised patients that are vulnerable to bacterial infections. Bacteriophages (phages) are viruses that infect bacteria. Temperate phages can integrate their genomes into the bacterial genome and their genes have the potential to increase bacterial fitness and drug resistance during this lysogenic infection. Lytic phages replicate and lyse the bacteria to release phage progeny and can serve as an alternative treatment to drug-resistant bacterial infections. To learn more about how phages can play these two opposing roles, we isolated the novel Gordonia phage, Oregano, from a soil sample in Maine. The genome of Oregano is 47,575 bp in length with a GC content of 66% and encodes 82 genes. Oregano is one of 20 members of the CZ4 cluster. Oregano is a temperate phage and encodes two tyrosine integrases and an immunity repressor. Genes 44 and 45 encode a putative VapBC toxin/antitoxin system, with the potential to degrade cellular RNA during cell stress such as superinfection by a phage or exposure to antibiotics. In future research lysogens of Oregano will be isolated and analyzed for superinfection immunity and changes in drug resistance.