Research Matters.
Scholarship Matters.
Creativity Matters.

Thinking Matters 2015

Friday, April 24th, 2015
8:30 a.m. - 3:00 p.m.
Abromson Hall, Portland campus

Thinking Matters 2015 is proudly sponsored by:
April 24, 2015

Dear Thinking Matters Participants,

Welcome to Thinking Matters 2015! The University of Southern Maine (USM) and Southern Maine Community College (SMCC) are proud to come together to celebrate the best research and community projects our students have worked on during the academic year. This is an opportunity for students to demonstrate all they have learned and to show how their research projects have contributed to new knowledge in their fields. Across disciplines and departments, the students presenting here today exhibit work that is innovative, creative, and collaborative in spirit.

This year, for the first time, both oral and poster sessions will take place concurrently in Abromson Hall. I hope that this will encourage folks to stick around, and see what amazing things our students are up to! As you will see, the presentations and posters at this year’s conference represent an impressive range of topics and modes of inquiry. The student-faculty collaborations on display today prove that higher education is indeed a source of innovation in many areas. Our guest speakers at breakfast and lunch will also highlight the relevance of student research and creativity for the local community in Southern Maine.

As 2015 chair for Thinking Matters, I am grateful to many people for their support in the planning and execution of this event. Associate Provost Samantha Langley-Turnbaugh of USM’s Office of Research Administration and Development provided invaluable resources. Margie Fahey, Associate Dean for Curriculum Design and Articulation at SMCC, has been indispensable in her coordination and planning with the SMCC community. I would like to pay special thanks to Trish Bola, who has been an incredible source of institutional knowledge, and who helped me coordinate across several different offices on campus. She served as a great advisor and helped to institute significant improvements to the Thinking Matters event. I must also thank Mary Joseph, Project Assistant for the Cutler Institute, for her management of our web resources. Special thanks to Bill Grubb and the USM library staff for assisting students with abstract writing and poster composition, and to Vinton Valentine of the Muskie School, who printed the majority of the posters on display at Thinking Matters today. USM student Zach Buckley created the Thinking Matters video testimonial that appears on our webpage. Marketing whiz Allie Meunier deserves recognition for her careful work on the Thinking Matters advertising materials and our improved conference program. The Honors Program at USM has provided invaluable logistical support and encouragement during the planning stages of this year’s conference. I would also like to thank two honors societies for their support of Thinking Matters: Golden Key International Honour Society, and the Honor Society of Phi Kappa Phi. Sherry Phillips of USM Conference Services should be recognized for her assistance with our new venue, Abromson Hall. Thanks also to Cecile Aitchison, of the USM Foundation, for her enthusiastic support of this event. Thinking Matters would not have been possible without Francesca Vassallo, whose vision for a new and improved student research conference forms the bedrock of today’s event. Finally, our outstanding faculty mentors are an integral part of this event, and deserve recognition for inspiring our students and supporting them throughout their research and creative projects.

More than anyone else, our students from USM and SMCC are the true protagonists of Thinking Matters. For them, this is not just an annual conference, it is the culmination of their research, scholarship and creative activity. The projects showcased at Thinking Matters represent the meaning of their academic work.

Thank you for joining us here today, as we celebrate interdisciplinary research and creativity in our southern Maine community!

Rebecca Nisetich
2015 Thinking Matters Chair
MEALS & SPEECHES

8:30 – 9:30 AM  Breakfast
9:00 – 9:20 AM  Welcome Remarks (Abromson Lobby)
                Dr. Ronald Cantor, President of SMCC
                Representative of USM
                Mayor Michael Brennan
10:45 – 11:00 AM  Coffee Break
12:30 – 1:30 PM  Lunch and Guest Speaker (Hannaford Hall)
                  Patrick Arnold, President & CEO of SoliDG

POSTER SESSIONS

9:30 – 11:30 AM  SESSION I (Abromson 109, 110, Lobby, Mezzanine)
1:30 – 3:30 PM  SESSION II (Abromson 109, 110, Lobby, Mezzanine)

ORAL PRESENTATIONS

9:30 – 10:45 AM  PANEL SESSION I (Abromson 213, 214, 215, 216)
11:00 – 12:15 PM  PANEL SESSION II (Abromson 213, 214, 215, 216)
1:45 – 3:00 PM  PANEL SESSION III (Abromson 213, 214, 215, 216)
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**SESSION 3 – 1:45 p.m. - 3:00 p.m.**

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1. Morality in Ovid: Interactions between Gods and Mortals

**University of Southern Maine**

**AUTHOR:** Kristopher R. Adams  
**FACULTY MENTOR:** Rebecca Nisetich

**ABSTRACT:**  
My presentation explores the interactions between humans and gods in Greco-Roman mythology. My research looks primarily at a myth by Ovid; a roman poet whose major work was the Metamorphoses. The focus of my research is psychological factors behind human actions with Gods, the reactions of the Gods towards these actions, and finally, the outcome from these actions. The myth I will present is of Arachne, a human girl, who boasts that she is better at weaving than the Goddess Minerva who challenged her to a contest. My talk will present the dialogue between Minerva and Arachne, suggest the likely psychological motives between the words of each, and detail the actions taken. Finally, listeners will learn a new interpretation of a Greco-Roman myth, as well as an understanding of Ovid’s presentation of immortal/mortal interactions and the morality involved.

2. Digital Dilemma of Communication: What is Deemed Appropriate?

**University of Southern Maine**

**AUTHOR:** Alexandra E. Andrews  
**FACULTY MENTOR:** Leonard Shedletsky

**ABSTRACT:**  
In this age the means of communication are endless; this can blur the lines of what is an appropriate setting for students and teachers to interact. It is typical to see students communicating with teachers via email, but texting offers easy, casual, instant communication between the two parties. The teacher/student relationship should be a blend of casual interaction and formal behavior, and being available to communicate with students is crucial for proper learning. The purpose of this presentation is to explore the ethical dilemma of whether texting is an appropriate means for students and teachers to interact on a digital scale. Yes or no, the answer you choose is right; it is right to want to protect both the teacher and student from engaging in inappropriate behavior via texting, and it is also right to allow students and teachers to openly interact. Ethical dilemmas such as these pin two right choices against one another, the options of each side must be weighed heavily and in order to make the best choice an individual must look deep into their core values to find what decision would fit for them personally. In this presentation I will delve into both viewpoints on this topic and investigate ethical dilemmas, as a whole, more in depth.

3. Modeling, Construction, and Measurement of the Magnetic Field of a 3-Axis Helmholtz Coil

**University of Southern Maine**

**AUTHOR:** Nicholas Anna  
**FACULTY MENTOR:** Bruce Thompson

**ABSTRACT:**  
This project set out to create 3 sets of coils that can create a uniform magnetic field with 1 nT resolution in each direction. This project was part of larger experiment to measure daily fluctuations in the earth’s magnetic field using a permanent magnet suspend on a string as a torsion pendulum. Major tasks undertaken include writing of software capable of making a 3D model of the magnetic field created by individual lengths of wire for multiple points in space, design of the coils to meet specification, construction, and experimental mapping of field output to current input.

4. Hiding, Seeking, Fitting In: Rural-Urban Dynamics and Gay Identity in mid-twentieth Century Maine

**University of Southern Maine**

**AUTHOR:** Harper Batsford  
**FACULTY MENTOR:** Libby Bischof
ABSTRACT:
With regard to the LGBT community, history often starts at 1969, the year of the Stonewall riots and the birth of modern gay rights activism. Lesbian, gay, bisexual and transgender individuals, however, did not emerge in 1969 fully developed. They came from communities which already existed, and had done so for quite some time. Yet, the nature of these communities, their interactions with the city around them and the wider national landscape, is, still, in 2015, somewhat a mystery. Though many lesbian and gay Mainers coming of age in the 1950s-1960s left the state to find community, it is vital to the understanding of gay culture in Maine and the gay rights movement in particular to remember that many returned and some even became key participants in gay rights activism in the following decades. These individuals were undoubtedly influenced by living with other gay and lesbian people in the city's gay enclaves, but still chose to return to Maine. Additionally there are many transplants, from New York in particular, who became dedicated advocates of Maine’s gay and lesbian community. While Maine developed its own gay culture and activism in the 1970s through the 1990s, it was continually influenced by interaction with gay culture in larger cities and on a national scale. This rural-urban dynamic is key to understanding the emergence of gay identity in the latter-half of the twentieth-century.

5. Better Days for All
University of Southern Maine
AUTHOR: Bethany K. Bernhardt
FACULTY MENTOR: Dennis Gilbert

ABSTRACT:
A group of media students was tasked to create a video documentary for a Non-Profit Organization as part of their capstone course. Their specific mission was to create a promotional video for the The Southern Maine Agency on Aging. This Non-Profit Organization is dedicated to the elderly of Maine who suffer from Dementia. They have two adult day car centers which provide activities and lunch for the members. A plan quickly unfolded to interview staff, caregivers, and members and to capture the members participating in the activities the center has to offer. Although the Agency has two center locations, the team decided to focus on the newer facility in Falmouth, the Stewart Center. When the project began the Agency appeared to be just a facility for the elderly, but when the filming process started it became so much more. With staff and caregiver testimonies it became clear of the positivity and happiness that SMAA instills. This is a place designed for everyone to have a brighter day!

6. Analysis of Cell Death in Larval Tissues to Understand the Hormonal Regulation at the Start of Insect Metamorphosis in Manduca sexta
University of Southern Maine
AUTHORS: Katherine L. Bonawitz, John Fitts
FACULTY MENTOR: David Champlin

ABSTRACT:
This research project is using the tobacco hornworm, Manduca sexta, as a model to understand hormone-regulated growth in insects. Insect growth has been studied in the past with focus on the growth of adult tissues, but we are taking a new approach by studying the early onset of programmed cell death (PCD) in larval tissues coordinated with adult growth. This allows us to simplify the search for a metamorphosis-inducing factor, which we hypothesize to be a death factor rather than a growth factor. Using closely staged animals we have analyzed the onset of cell death in the crochet epidermis tissue using DNA staining techniques. After establishing the critical point, we will use staged blood to induce PCD in earlier stages and characterize the death factor.

7. Creating a Space for Personhood: a Critical Study of Hannah Arendt
University of Southern Maine
AUTHOR: Megean M. Bourgeois
FACULTY MENTOR: Ronald Schmidt
ABSTRACT:
Hannah Arendt was a voracious scholar of American and European history. Beginning her academic career as a philosopher, she made it her life’s mission to understand what it is we are doing, to uncover the framework of our thought and action and make it visible to the world. The voice of her writing is clear, frank and authoritative. Beneath this public voice, however, lurks a profound internal tension. Arendt’s transition from philosophy to political theory is tied to experiences of persecution, compassion and betrayal that she seems desperate to rationalize. She argues that the vitality of the political realm depends upon distinguishing the public from the private, protecting the inner life from the public world and vice versa. Both parts of life are essential, and mixing the two risks the destruction of both. As she delineates the private and public, a third realm emerges: the social. The social appears in Arendt’s work as a flickering shadow, intangible and continuously changing forms. This presentation, which grows out of an independent study with Professor Ronald Schmidt, is an attempt to understand the implications and unintentional results of this division of the human condition that Arendt demands. Examining the failures of her public-private distinction, this presentation reflects my search for alternatives in Arendt’s conception of the social, and my attempt to relieve the internal tension that raged between Arendt’s love of the world and her desire to separate politics from it.

8. The Letters of Merritt Morse

*University of Southern Maine*

**AUTHOR:** Darien P. Brahms

**FACULTY MENTOR:** Adam Tuchinsky

**ABSTRACT:**
This work in progress, sponsored by a fellowship through the Undergraduate Research Opportunities Program, focuses on the transcription of the letters of Merritt Morse, a Union soldier stationed in South Carolina and Virginia during the Civil War. From 1862 to 1865, Morse documented his experiences in letters penned to his beloved wife, Hattie, back home in New Hampshire and his correspondence contains articulate observations of daily life during the conflict as well as detailed accounts of battles, slavery, socioeconomic and sanitary conditions, and encounters with many prominent figures of the day. Like most Northern soldiers who enlisted in the early years of the Civil War, Morse fought for the cause of Union preservation. However, his participation in assisting recently emancipated African-Americans in their transition to freedom and his racially progressive attitudes suggest a moral impetus for enlistment. Prior to starting this project, little was known about Merritt Morse. Using his own words as a basis, my research focuses upon Morse’s biographical background, religious and political influences, and war experiences. In particular, I argue that Morse’s perspectives on slavery and racial issues were unique, placing him in a minority among his fellow soldiers, most of whom did not share his views. My ultimate goal is to publish a transcription of the letters with a contextualized biography, contributing Merritt Morse’s distinctive voice to the existing canon of Civil War literature.

9. Risk Factors and Protective Factors of LGBTQ/Q Youth in Maine

*University of Southern Maine*

**AUTHOR:** Bridget Goyette

**FACULTY MENTOR:** Liz Turesky

**ABSTRACT:**
This thesis brings together research addressing risk factors and protective factors present in the lives of GLBTQ/Q youth in Maine drawing on both interview and survey data. Interview data focuses on risk and protective factors in four areas: School, Community, Family and Individual. Survey data address those four areas and provide additional information including: demographics, substance use, suicidal thoughts and attempts, sources of information and support as well as respondent’s experience with violence and discrimination. The purpose of this thesis is to examine internal and external risk and protective factors in the lives of Maine lesbian, gay, bisexual, transgender, queer and/or questioning (LGBTQ/Q) people between the ages of 14 and 28. As a result of my findings, I propose action steps that may be taken to reduce risk factors and/or increase protective factors in the lives of LGBTQ/Q youth. I also make recommendations for changes that can be implemented in each of these areas so that schools, families, social service agencies, and communities can foster resiliency in the lives of Maine LGBTQ/Q youth.
10. The King Tides Trail: Visualizing Sea Level Rise in Portland, Maine
*University of Southern Maine*
**AUTHORS:** Ken Gross, Lisa Willey  
**FACULTY MENTOR:** Jan Piribeck

**ABSTRACT:**
As a student group (Shaping the Terrain: Art 312), we explored the environmental and social ramifications of sea level rise in Portland, Maine. Using scientific research, GIS technology, and creativity, we took the subject of sea level rise out of the science-based curriculum and before the public by creating socially engaged art installations. Online maps, zine guidebooks, beacons and markers were utilized to delineate future sea level rise throughout Portland’s East End. Social media, as well as traditional media coverage helped reach broad public audiences to raise awareness about a phenomenon that is impacting the Portland peninsula and waterfront. The project demonstrated the potential for the arts and sciences to find common ground in visualizing sea level change.

11. Zooarchaeology of Smuttynose Island: A Study of Trophic Relationships in the Historic Isles of Shoals
*University of Southern Maine*
**AUTHOR:** Roxanne E. Guildford  
**FACULTY MENTOR:** Nathan D. Hamilton

**ABSTRACT:**
The goal of this project is to gain a better understanding of the trophic relationship between the historical European occupants of Smuttynose Island of the Isles of Shoals, and the livestock introduced to the island during the 17th century. Information on mundane subsistence practices are often not mentioned in the historical record; through zooarchaeological retrieval and analysis we can now infer part of that historical relationship. Expanding on this work, faunal remains from pigs, sheep/goat, and cow are analyzed in order to determine age and culling practices of domesticated animals on Smuttynose Island. Additional bone remains from birds, fish, and shell remains of mollusks are included in a comprehensive database of animals on the island used in the historical diet. Isotopic analysis performed at Bates College documents a strong marine plant and refuse diet for the island-bound pigs; with ready access to resources not restricted to pasture, the faunal assemblage supports that domesticated pigs dominated as the island’s primary terrestrial food source. The samples for this project were taken from a deeply stratified 17th century occupation area; the excavation area of ca. 20 m² chosen for this project includes the domestic pig specimens that were previously analyzed by the author and presented at USM’s Thinking Matters in 2013.

12. Assessment of technologies for estimating forest canopy cover using photo imaging and thermal imaging devices
*University of Southern Maine*
**AUTHOR:** Sarah Henderson  
**FACULTY MENTOR:** Joseph Staples

**ABSTRACT:**
Forests serve as a vital component in the biogeochemical cycling of energy and nutrients. Analysis of forest canopy cover is a parameter regularly employed for monitoring forest health. Ground based estimates of forest canopy cover typically involve visual assessment, image analysis, or analysis of light intensity that can vary substantially between operators, methods, technologies, and time of day. This project compares technologies for estimating forest canopy cover using a research-grade standard canopy imaging system, hemispherical photography, a tablet, smartphones, and handheld thermal imaging cameras. The aim of this research is to assess the effectiveness of using consumer based digital and thermal imaging systems for estimating forest canopy cover. Thermal imaging is of particular interest because it is not dependent on ambient light conditions as is the case with other digital imaging systems. Here we present image analyses from each system with special emphasis on assessing the effectiveness using ground-based thermal imaging devices to characterize canopy cover.
13. Aspire to Inspire  
*University of Southern Maine*  
**AUTHORS:** Tori Houle, Keir Devou, Sarah Lundgren, Hayden Petersen  
**FACULTY MENTOR:** Dennis Gilbert

**ABSTRACT:**  
Hearing the words, "your child has cancer", is arguably the most tragic words a parent can hear. The Maine Children’s Cancer Program (MCCP) is a center for children to come and receive beyond just treatment. Families can expect to find a dedicated staff and a wonderful welcoming community. While the MCCP is a treatment center dedicated to children and young adults who have been diagnosed with cancer and blood disorders, the clinic also serves as a research center with people devoting their time and energy to finding a cure for this devastating disease. For this project it is our mission to create a video that the organization can use to help them achieve more financial support for their research and treatment programs. This video will contain interviews with childhood cancer patients, survivors and their families. Some of the fundraising events included in the presentation are a polar dip, a silent auction and an ice fishing derby. The fundraising events put together by MCCP create an opportunity not only to get involved, but for other families who are also patients at the facility to connect and meet with each other. Fundraisers are a huge part of the clinic. Not only do fundraising events generate donations that go towards cancer research, they are places that people can get together outside of the clinic in a more positive environment. You are able to show your support in a big way by attending and volunteering at these events. How can you get involved? Let us show you.

*University of Southern Maine*  
**AUTHOR:** Nicole Kearns  
**FACULTY MENTOR:** Glenn Wilson

**ABSTRACT:**  
This research focuses on the language of the rogue, or fraudulent, antivirus software variation of ransomware. Unlike other variations of ransomware, the tactics of the rogue security software focused on deceiving the user into considering it legitimate security software. The relevance of studying the language of rogue security software was to determine and classify the types of words used the most to facilitate a financial transaction. The results showed that rogues appeared to use more aggressive types words which focused on what was wrong with the user’s computer. In contrast, the language of legitimate software focused on what the software can do to assist the user.

15. "Bitches," "Queens," and Beyond: extending ecofeminist concern for female bodied farmed animals to companion species  
*University of Southern Maine*  
**AUTHOR:** Caitlin E. Kelty-Huber  
**FACULTY MENTOR:** Piers Beirne

**ABSTRACT:**  
Feminist theorists from ecofeminist backgrounds have done much work to illuminate the lives of nonhuman animals in the context of human systems of exploitation. Within this cohort, specific attention has been given to female bodied farmed animals in industrial settings, and the trauma and suffering caused by forced insemination, controlled pregnancies and child rearing, and premature mother-child separation. Blending classic ecofeminist theory with newer scholarship, I will suggest a framework for considering reproductive violence which attempts to encompass the experience of all nonhumans whose reproductive systems are exploited by humans. To demonstrate, I will transpose this framework onto the lives of “bitches” and “queens,” as well as “studs” and “sires,” cats and dogs used for breeding purebreds and “designer” breed companion animals, both in USDA commercial breeding facilities (puppy mills), and smaller “backyard” operations. I will then critique the framework, assess its strengths and weaknesses, and explore the ramifications of aligning these two disparate groups (farmed and animals appointed as companions). The paper will conclude by envisioning what a future free of reproductive violence might look like, and how we may arrive there. In so doing, I will second Carmen M. Cusack’s suggestion that, feminist theory and praxis should extend to all females, mothers, children, vaginas, anuses, and subordinated victims of abuse regardless of society’s condonation of cruelty (2013:24).

*University of Southern Maine*

**AUTHORS:** Cody E. Marcroft, Anthony Dighello, Alyssa Thomson, Alexander Tranchemontagne

**FACULTY MENTOR:** Dennis Gilbert

**ABSTRACT:**
We are documenting the work of Traci Molloy, the artist-in-residence (AIR) at the University of Southern Maine for the spring 2015 semester. Based in Brooklyn, New York, Molloy integrates photography, printmaking, painting and digital art techniques to explore youth culture, violence, loss and identity. The AIR program is a flexible course featuring a guest who designs a project that involves USM art students with the greater community to produce artwork for public display. Molloy is collaborating with the middle and high school groups of youth refugees at the Center for Grieving Children (CGC) in Portland. A portion of the documentary will also focus on Billy Libby, a singer, songwriter and multi-instrumentalist who is also working with the CGC groups as part of his *Your Song, Your Story* program. His project uses songwriting to help children deal with trauma or grief in their lives. Each group writes, rehearses and records a song with Libby, who then adds instrumentation to create the final product. This documentary film, which serves as our capstone project, requires student-faculty collaboration, engages us with the community, and grants us the opportunity to creatively demonstrate the skills we have acquired as communication and media students at USM.

17. The Gospel Reinvented: A New Addition to the Jesus of Alan Watts

*University of Southern Maine*

**AUTHOR:** Weston Masi

**FACULTY MENTOR:** Rebecca Nisetich

**ABSTRACT:**
This presentation analyzes and expands upon the ideas of one of the most widely acclaimed religious thinkers of the twentieth century, Alan Watts. Watts attempted to use eastern religions as a lens for reinterpreting the message of Jesus’s gospel. Watts proposed that Jesus’s experience of consciousness was not unique unto himself; furthermore, he asserted that any person can achieve Jesus’s level of divinity once they understand that everything, oneself included, is a manifestation of God. To further Watts’s claim, I bring in an ancient Christian source which was unavailable to Watts during his lifetime- the Gospel of Thomas. Using Watts’s theory as a lens of interpretation, I analyze select verses from the Gospel of Thomas in which Jesus appears to be asserting the same claims that Watts argues. In my analysis of Watts and the Gospel of Thomas, I suggest that Watts’s perceptions of Jesus have religious, historical, and scriptural backing beyond the evidence he was able to present during his lifetime. Furthermore, once Jesus is considered in this manner, certain verses within the New Testament Gospels, particularly the Gospel of John, can be understood quite differently than how they are traditionally interpreted. My addition of the Gospel of Thomas to Watts’s argument reveals that the message of Jesus may be about the existence of God within all things- that is, that you too contain the same level of divinity as Jesus.

18. The Follower’s Dilemma: Giving Honest Upward Feedback to Supervisors in the Fear of Retaliation and Breach of Confidentiality

*University of Southern Maine*

**AUTHOR:** Christopher Massaro

**FACULTY MENTOR:** Elizabeth Turesky

**ABSTRACT:**
This study explored how the perception of confidentiality and the fear of retaliation may influence the participant’s desire to provide upward feedback to their immediate supervisor and other leaders within an organization. The research design consisted of a survey instrument distributed to employees of the University of Southern Maine (USM). The sample population included both supervisors and supervised employees. Using a Likert scale, the survey questionnaire asked employees to state their agreement on questions dealing with confidentiality, fear of retaliation, and willingness to provide upward feedback in the workplace. Results from the research indicated
a statistically significant correlation between a respondent’s perception of confidentiality and fear of retaliation, and the individual’s
desire to provide upward feedback. A cross tabulation analysis indicated differences in the willingness to participate and the accuracy of
the feedback based on a respondent’s gender, age, and length of employment with USM. This study was designed to build on previous
research in upward feedback, workplace communication, and 360° feedback systems. The results from the survey suggest further
research to explore differences in formal and informal upward feedback, gender bias in employee communication, and the influence of
organizational culture on the employee’s willingness to provide upward feedback.

19. GenomePatternScan: Computational identification of genome-wide binding sites for FOXD1

*University of Southern Maine*

**AUTHORS:** Samuel McFarland, Clare B. Congdon, Christine W. Duarte, Jennifer Fetting, Craig R. Lessard, Leif Oxenburgh,
Jeffrey A. Thompson

**FACULTY MENTOR:** Clare B. Congdon

**ABSTRACT:**
We have developed GenomePatternScan (GPS), a computational tool that identifies the locations of a transcription factor binding site (or
another DNA pattern, specified by the user) throughout a genome or other long genetic sequence. In this work, we use GPS to identify
genes that may be regulated by FOXD1, an important transcription factor in kidney development. As input, the program requires the pattern
to search for and sequence data to search through. The transcription factor may be represented using the standard A, C, G, T abbreviations
or the extended IUPAC notation. The program uses gene annotation data to identify where matches occur relative to known coding regions.
As a default, genomes for human, rat, and mouse are provided, along with their annotations; other genomes can easily be added. Output
from the system includes the genetic context of each candidate hit as well as a link to the UCSC Genome Browser to simplify further
investigation of the genomic context. Recent additions to GPS include using synteny to look for hits in the same gene across different
species and the ability to input a list of particular genes of interest. Using GPS, we identified 512 candidate locations of the FOXD1
binding site in the noncoding regions for the same genes in human, rat, and mouse. We further reduced this list by cross-referencing with
literature searches. We are currently working on confirming the resulting short list of genes in the lab.

20. Where did all the young people go? Can the State of Maine Re-enlist its native youth?

*University of Southern Maine*

**AUTHOR:** Tyler N. McPherson

**FACULTY MENTOR:** Elizabeth Turesky

**ABSTRACT:**
As Maine and other New England states continue to be amongst the eldest in the United States, organizations in these states continue
to struggle to find suitable, younger replacements for their retiring leadership. As the millennial generation continues to join and become
a significant portion of the American workforce, learning how to connect with, recruit, and retain this generation will prove useful when
leadership succession is required. By exploring when and why this trend may have begun, we can begin to understand ways, such as
non-traditional mentoring relationships, in which New England’s organizations can begin to recruit and retain their future leaders. Through
a qualitative, grounded theory study of millennial employees at one global organization with five New England locations, this study hopes
to build upon previous studies that suggest that one method to connect with and retain millennial employees is to create a non-traditional
mentoring program for which this cohort can participate in. Through researching how it is that these millennials experience one of these
programs through their own words, this research expects to find that millennials not only appreciate and enjoy participation within one of
these programs, but participation also strengthens this cohort’s connections to their organization.

21. Shepherd of Being

*University of Southern Maine*

**AUTHOR:** Sergey Miller

**FACULTY MENTOR:** Rebecca Nisetich
ABSTRACT:
My presentation will explore the complexities of humankind’s relationship with nature through reading Virgil’s first eclogue as a metaphor for how humankind dwells and fails to dwell with nature. As I will demonstrate, the relationship between humankind and the natural world reflects the same complications and pleasures which Virgil’s shepherds face in their lives. Though there are many ways to read Virgil’s text, my claim is that a Heideggerian reading slows down the claims of understanding nature as an easy concept or an object for human use. After a brief summary of the first eclogue, I will contrast ecocritical and Heideggerian readings of the text. Though many read Virgil in an Ecocritical way, an admittedly diverse way of reading which highlights the connections of ancient pastoral poetry to current political discourse, I argue that this way of reading obscures human being’s phenomenological relationship with nature. While ecocritical reading illuminates the complicated relationship between humankind and nature, I argue that an understanding of how humankind dwells within nature must take the form of a preparatory phenomenological ontology. The lived experience of Virgil’s shepherds will show that the treatment of nature by dwelling human beings must be a process of letting-be.

22. Further Investigation of Student Motivation, Parent-Child Relationships and Self-Concept: The Role of Socioeconomic Status
University of Southern Maine
AUTHORS: Gregory Mills, Bruce Thompson
FACULTY MENTOR: Bruce Thompson

ABSTRACT:
Several theoretical approaches have been used to examine the influences of academic achievement in past research such as Self-Determination Theory (Deci & Ryan,1985), Self-Concept Theory (Marsh, 2007), and the influence of social relationships affect both motivational factors and academic self-concept, influencing achievement outcomes (Gottfried, Fleming, & Gottfried,1994; Wentzel, 1998). The current study is an adaptation of the aforementioned theoretical approaches, and extends a recent study (Mills & Thompson, 2014) that explored links among parent-child relationships, personality, and achievement motivation. In particular, we found that measures of parent warmth, autonomy support, and involvement were significant, negative predictors of student motivation. Preliminary examination of SES revealed differences in the strength of these association. Thus, in addition, due to the current lack of information in the literature, the current study was also meant to investigate the possible relationships between SES and the aforementioned variables. Fifty-five first-year students at the University of Southern Maine completed a questionnaire that measured each of the aforementioned variables. An unexpected finding was that SES was negatively correlated with each of the three measures of intrinsic motivation (all p< .05). This finding is consistent with Shernoff and Schmidt (2008) where low community SES was linked to higher engagement and intrinsic motivation in classrooms compared to more students from more affluent communities.

23. Raising Awareness of Arts in Education through New Media
University of Southern Maine
AUTHORS: Orin Myth, Brittany Pace, Timothy Smith, Ryan Weed
FACULTY MENTOR: Dennis Gilbert

ABSTRACT:
Raising Awareness of Arts in Education through New Media is the culmination of a Service Learning Capstone Project. Our group is made up of T. Smith, R. Weed, B. Pace, and O. Myth - all seniors in the University of Southern Maine Media Studies Program. We are working to produce a promotional video for Side x Side - a group of parents and educators who are passionate about integrating art into K-12 education. This organization has been awarded a U.S. Department of Education grant to pilot an arts-based curriculum into elementary, middle, and high school classroom practices. Our project centers on production of a 5-minute video to showcase the need for Side x Side’s contribution, as well as the enthusiasm of all those involved and impacted by their projects - the educators, guests, and of course, the kids themselves. We are hoping to present this video in a couple of formats - one, which would be suitable for quick playback on the web, and another, high-quality video, which can be projected onto a large screen, and used during awareness or fundraising events. During the Thinking Matters event, we will have a brief oral presentation, as well as show the video that we have produced.
24. Circles Associated With Any Given Triangle  
*University of Southern Maine*  
**AUTHORS:** Tyler W. Nelson  
**FACULTY MENTOR:** Silvia R. Valdes-Leon  

**ABSTRACT:**  
One of the purposes of this project is to compile some of the work done, as class activities, in the course MAT 371, Euclidean Geometry. In addition we include some interesting geometric results beyond those covered in class. Given any triangle, we will show a construction of a many interesting circles pertaining to that specified triangle. Among those circles are the following: the incircle, the circumcircle, the ninepoint circle, and the excircles. We give an example of a triangle in which many of those circles coincide. Also we will show other objects such as the Euler points, the Fermat point, and the Euler line.

25. 4-H Leadership Development in Southern Maine: Community Clubs and School/Afterschool Clubs  
*University of Southern Maine*  
**AUTHOR:** Laura K. Personette  
**FACULTY MENTOR:** Elizabeth Turesky  

**ABSTRACT:**  
The adolescent years are a time of great self-discovery and development, a time of fostering skills that will serve individuals throughout adulthood. Leadership development in youth can be furthered through opportunities for youth to lead amongst their peers and in youth-adult partnerships. Researchers have highlighted that many youth leadership development programs are created with a basis in adult leadership theory (Mortensen, Lichty, Foster-Fishman, Harfst, Hockin, Warsinske, and Abdullah, 2014). While larger studies within youth leadership began in the mid-1900s, studies of leadership theory, development, practice, and dynamics in youth have not been widely reviewed until the past couple of decades (MacNeil, 2006). The focus of this study is to take a closer look at the leadership development experiences of youth involved with the 4-H program in Southern Maine. Specifically, the study seeks to compare self-reported levels of leadership experience and/or development between youth involved in community 4-H clubs or school/after-school 4-H clubs. This was accomplished through surveying club youth ages 12-19 about their leadership exposure and experiences. Club leaders were also surveyed to determine the inclusion of seven principles of effective youth leadership programs as identified by Culp & Cox (2002). The results will determine the effects of these principles on the youth leadership development within each club type.

26. Design and Fabrication of Parabolic Mirrors for Concentrated Solar Tracking Photovoltaic Generators  
*University of Southern Maine*  
**AUTHOR:** Cody A. Poland  
**FACULTY MENTOR:** Mustafa Guvench  

**ABSTRACT:**  
The purpose of this project is to design, fabricate, install and test large area parabolic mirror assemblies for use in concentrated solar tracking photovoltaic generation. Primary goal is to achieve solar concentration ratios greater that up to 10000X on focal area as small as 1 cm^2 using aluminized flexible and UV durable plastic strips comfortably fixed on a rib structure which defines a parabolic surface. The structure is robust and durable for outdoor use under harsh weather conditions. It will be assembled on a solar tracking photovoltaic generator to demonstrate efficient solar energy conversion with multi-junction solar cells.

27. Waste to Fuel  
*University of Southern Maine*  
**AUTHOR:** Nicholas M. Randall  
**FACULTY MENTOR:** James Masi
ABSTRACT:
The goal of this project was to see if using agricultural waste would produce enough product to be fermented into ethanol fuel for agricultural applications like generators, small engines and farming equipment. In this project, apple drops are the waste product used. Apple drops are the apples that drop from the tree and cannot be sold and would otherwise be a waste for apple orchards. To produce ethanol from waste generated by the agricultural business the first step would be fermentation of the waste. The next part would be distillation of the fermented waste. This project involved setting up a fermentation tank, a still, and boiler. Setting up fermentation tank and still was the primary objective. This involved designing a fermentation vessel from recycled 55-gallon drums and setting up a boiler that was fueled by wood.

28. Leadership in Adult Education
University of Southern Maine
AUTHOR: Monique Roy
FACULTY MENTOR: Elizabeth Turesky

ABSTRACT:
This study looks at leadership behaviors of Adult Education Directors (AEDs) in the State of Maine through the lens of the Kouzes and Posner Leadership Practices Inventory. AEDs self-reported their behavior in relationship to the Five Practices described in Kouzes and Posner’s Leadership Challenge. Those five practices are: Model the way, Inspire a shared vision, Challenge the process, Enable others to act, and Encourage the heart. The results of this study appear to indicate that there are common behaviors among AEDs, indicating that a shared or transformational model of leadership is preferred in the Adult Education field.

29. Firewall: An Exploration in Interactive Media and Game Development
University of Southern Maine
AUTHOR: Jonah Sanville
FACULTY MENTOR: Raphael Diluzio

ABSTRACT:
Video game development is a field which is quickly growing in importance. Here at USM, as a group of students, we are developing a video game called Firewall. This is being developed using a game engine called Unity3D and the programming is written in C#. It is classified as a “roguelike”, the general name for games based loosely on a 1980 computer game called Rogue. These games have features such as the ability to upgrade your character, algorithmic generation of scenarios, and “permadeath” (meaning you have to restart the game every time you lose, as opposed to periodically saving your progress). We are a team of 4 people working in a special research studio for students on the Portland campus. We are using a service called Photon for the multiplayer networking (meaning that this game is playable in groups over the internet). We will talk about the game, what we have developed so far, and what we plan to develop.

30. Portland First Friday Artwalk
University of Southern Maine
AUTHORS: Paul A. Schauber, Tracy Stutzman
FACULTY MENTOR: Tracy Stutzman

ABSTRACT:
In the fall of 2014 University of Southern Maine Tourism and Hospitality students in the TAH 241 Cultural Tourism class worked in conjunction with Creative Portland (a Portland-based non-profit that organizes the Portland First Friday Artwalk) in surveying one hundred and eighty attendees of the Portland First Friday Art Walk over a period of three months. This project was inspired by a concern expressed by some to Creative Portland that the monthly art walk in downtown Portland is not about art anymore. Data collected shows this is likely not the case. The research presented here lists the reasons attendees participate in the art walk, if attendees buy art during the art walk,
the typical demographics of attendees, and ideas and issues attendees have about the art walk. This insight is aiding the staff of Creative Portland as they work to support artists, art businesses, and cultural tourism in Portland.

31. Student Travel Class at USM: Research and Analysis

*University of Southern Maine*

**AUTHOR:** Erin T. Smith  
**FACULTY MENTOR:** Tracy Michaud-Stutzman

**ABSTRACT:** During the spring 2014 semester, a University of Southern Maine (USM) Tourism and Hospitality (TAH) travel class going to New York was cancelled. In fact, all three of the TAH travel classes that year and many of USM’s travel classes were unable to get the number of students they needed in order to run. The research presented here looks at why USM TAH students were not signing up for these travel classes. Through surveys, focus groups and individual interviews with faculty and students, it analyzes the underlying factors of how and why USM TAH students and faculty make decisions on participating in a travel course (a class that is taught in a place away from the University) and assesses the reasons why TAH students were not taking them. It was these findings that helped the TAH degree program develop a more relevant and affordable travel class with community partner, AAA-Northern New England that has an extremely high enrollment for the summer 2015 semester.

32. Motivating the Generations: Implications for the Higher Education Workplace

*University of Southern Maine*

**AUTHOR:** Jennifer L. Smith  
**FACULTY MENTOR:** Elizabeth F. Turesky

**ABSTRACT:** Motivated employees are an organization’s most valuable asset. Motivation boosts better performance and productivity on the part of workers, so determining the best ways to encourage employee motivation is significant. This thesis examines the ranked importance of motivational factors of professional and classified, full-time employees at USM. More specifically, this thesis deals with the generational differences in the motivational factors of the examined population. Insight into the differences in generational footprints and their motivations can provide management useful tools for improving the work environment. Research for the study includes a literature review, focusing on generational stereotypes and two content theories. These two theories are used as a foundation to question and analyze data collected in an exploratory sequential mixed methods design. The survey distributed addressed thirteen motivating factors in the context of employee motivation theory. The purpose of the measuring instrument was to identify the rank importance of these identified factors of motivation and determine if generational differences exist in the surveyed population. Even though the literature review suggested significant differences between the motivational profiles of employees in different generational cohorts, this study finds more similarities than differences in university employee motivations. Based on the findings, recommendations are given, in terms of improvement of motivation policies and practices.

33. Exploring Volunteer Recruitment to and Retention in Citizen Science River Herring Monitoring Programs in Maine and Massachusetts

*University of Southern Maine*

**AUTHOR:** Jason M. Smith  
**FACULTY MENTOR:** Karen Wilson

**ABSTRACT:** Volunteer, citizen science river herring monitoring programs in Maine and Massachusetts are asked to collect data that is considered by decision-making groups to assess stock status, determine future management options, and evaluate the impacts of restoration activities. Reliance on these volunteer groups means assessing strategies used to promote their involvement and retention can provide information to help correct barriers that can decrease program effectiveness. This research had three objectives: 1) Identify common communication and organizational practices, 2) Identify factors discouraging and encouraging volunteer participation, and 3) Measure volunteer preferred
mode of involvement. After interviewing monitoring coordinators and participant observation of citizen scientists at river herring monitoring sites, pilot results were incorporated into an online survey of volunteers involved in river herring monitoring programs in Maine (ME) and Massachusetts (MA) (n=176). Communication, particularly feedback of fish counts, was important to volunteers. Results showed that volunteers were generally satisfied with levels and modes of communication, and with training provided by volunteer coordinators. Concern for the local ecosystem was the most reported reason for volunteer participation. Respondents also indicated interest in having more diverse involvement with programs, including identifying research questions (45%), data entry and organization (31.52%), and discussing management of their local run (48%).

34. WALL-E: The Impact of Technological Dependence  
*University of Southern Maine*  
**AUTHOR:** Alyssa Thomson  
**FACULTY MENTOR:** Daniel Panici  
**ABSTRACT:**  
The Disney film WALL-E is not only a story about a lovable robot, but as a repurposed text offers insight into our relationship with technology. In this critical essay, I argue that the world presented in WALL-E is the culmination of generations of promoting the technologically sublime; in essence, we no longer ask question about technology but, rather, embrace a technologically dependent existence. Humanity’s relationship to technology follows a cyclical path. We continually crave to advance and expand our technology, but once it is completely dominant, we will begin to crave the more Edenic qualities of life. I argue that WALL-E is a projection of the current technological sublime, and a desire for rediscovering humanity in a technologically dominant existence. I explore the impact of this projected world on culture, and the corresponding difference between “places” and “spaces” as defined by Thomas P. Hughes in “Human-Built World”. My presentation would focus on WALL-E and the “spark” for pure organic connections that he both ironically craves and completely embodies. He is a catalyst in the film’s progression, and his role sheds light on the unintended consequences that could result from continually pushing our technology forward. The film is used to take a critical look at the complexity of our current relationship to technology and our visions for the future, and what the impact could be if those visions were to come to fruition.

35. Using a Classical View of Ecology in a Postmodern Age  
*University of Southern Maine*  
**AUTHOR:** Richard Urban  
**FACULTY MENTOR:** Benjamin Bertram  
**ABSTRACT:**  
This ecocritical study of Virgil (70 BC - 19 BC) and George Wither (1588 - 1667) illustrates how their similar didactic forms establish humanity’s position within nature. Ecocriticism, a form of critical literary theory, examines humanity’s expression of its relationship with nature through the literature it produces. With a focus on the representation of labor in Virgil’s Georgics and Wither’s Collection of Emblems, I show how their allegorical poetry and emblematic woodcuts place ethical demands on humans. These demands incorporate the virtues of hard work, piety, peace, and reason as ways to improve their lives as well as their environment. By taking what ecocritics call “an earth centered approach to literary studies,” we acknowledge our understanding of the importance of our natural environment as well as the impact humanity has on it, and accept our responsibility for preserving it. I will also illustrate how the basic tenets of georgic and emblematic modes are being mobilized in today’s society. That is, I show how we might adapt classical views to our postmodern age as a means of encouraging a renewed emphasis on humanity’s place within nature.

36. Stories of Casco Bay  
*University of Southern Maine*  
**AUTHOR:** Grace Waldron  
**FACULTY MENTOR:** Dennis Gilbert
ABSTRACT:
Our team of Media Studies majors is working with the Casco Bay Estuary Partnership to tell the stories of the people, organizations, and businesses that work towards the betterment of Casco Bay. In a set of 2-3 minute videos we will be representing CBEP as well as individuals from other local organizations and businesses, all in an effort to capture their perspectives on the importance of the estuary. Through interviews and on-site filming, we are telling the stories of those who devote their lives and interests to keeping the bay pristine. This work is the first time CBEP's Casco Bay Stories project has been carried on through the winter. As a result, all videos will be added to the CBEP website in an effort to publicly highlight the individuals who call this beautiful seascape home.

37. Using Trehalose Analogues to Determine Its Fundamental Functional Structure
University of Southern Maine
AUTHORS: Joseph C. Walter, Christopher M. Fitzgerald
FACULTY MENTOR: Peter Woodruff

ABSTRACT:
Proteins, the complex molecules that act as the building blocks of organic life, are typically destroyed when exposed to high temperatures. Some microorganisms like Saccharomyces cerevisiae, commonly known as baker’s yeast, are able to survive in these extreme conditions by using trehalose. Trehalose acts as a shield for proteins and protects them from the effects of the heat which allows the microorganism to survive, but it is unknown exactly how trehalose is able to function in this way. In order to better understand how trehalose works on a chemical level we will use similar molecules (analogues) to protect an enzyme, tyrosinase. This project will test the analogue’s ability to protect tyrosinase as well as trehalose protects it. The results of the tests will help us determine the components vital to the structure of trehalose.

38. Mosquito Parasitism by Aquatic Mites in Maine
University of Southern Maine
AUTHOR: Margret E. Welch
FACULTY MENTOR: Dr. Joseph K. Staples

ABSTRACT:
Diseases such as West Nile Virus and Eastern Equine Encephalitis are two common mosquito vectored pathogens that can be transmitted between birds and mammals. Mosquitoes carrying both pathogens have been identified in Maine on multiple occasions. While mosquitoes are known to vector disease to humans and animals, it is little known that they are commonly parasitized by terrestrial and aquatic mites. To examine the degree to which mosquitoes in Maine are parasitized, a statewide survey examining the occurrence and degree of parasitism in adult female mosquitoes by larval aquatic mites (Acari: Parasitengona: Hydrachnid) was conducted throughout the summer of 2014. We found that, in 2014, 6.1% mosquitoes identified were parasitized and 88.3% of the mites were located on the mosquito’s thorax. We were also able to determine that the most parasitized climate region in Maine is the Southern Interior region. The results from this survey provide valuable insight into common influences of interspecific population dynamics between mosquitoes and mites in Maine.
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1. A DLP Stereolithographic 3D Printer for Research in Additive Manufacturing
   
   University of Southern Maine
   
   AUTHORS: Matthew Araujo, Galen Richmond
   
   FACULTY MENTOR: Mustafa Guvench
   
   ABSTRACT: The field of additive manufacturing (AM) and 3D printing technologies is rapidly developing. Industrial 3D printers have been in operation since the mid 1980s, however, the field has expanded significantly in the last five years since the advent of home 3D printing. The objective of this project is to design and build a modular 3D printer to promote experimentation and research at USM into high resolution additive manufacturing. From the several printing technologies available, a printer using Digital Light Processing (DLP) has been chosen for its high resolution capabilities and potential use in micro-manufacturing of parts with some built-in electrical functionality as well as mechanical structure. The printer works by exposing successive thin layers (10-100μm) of UV sensitive resin to light patterned from sliced images (.stl) of a 3D CAD model. The UV exposure acts as a catalyst to harden the material. The technique is known as "Stereolithographic" 3D printing (STL). Because light is used as the medium, high resolution printing is possible. Theoretically the resolution of objects printed with this technique is limited by the wavelength of the light used (<400 nm). An overview of DLP STL 3D printing will be given followed by the details of our design, including its mechanical and electrical drive structure, its control circuitry, DLP synchronization and PC software. Samples of 3D prints will be shown which demonstrate the level of printing resolution attained with the first generation design.

2. A data independent monitoring system
   
   University of Southern Maine
   
   AUTHOR: Samuel Barton
   
   FACULTY MENTOR: Glenn Wilson
   
   ABSTRACT: The technological developments which have made the smartphone possible have had an interesting side effect, namely the ability to make cheap tiny computers which fit in a case smaller than an Altoids tin. Various devices can be attached to these computers to gather all kinds of data, and while their storage capability is small, they have great potential as data gathering tools. The idea is to build a framework for gathering and reporting data which is independent of the data itself. These micro-computers will be used to gather data; software will be developed to communicate with, display, and store our data on the server; and drivers and other pieces of software needed on the micro-computers to gather the data itself will be written. Part of this software work is customizing a version of Ubuntu server to work on our micro-computers. At this time we are in the early stages of this project.

3. Analgesic Efficacy of Combining Acetaminophen and NSAIDs for Pain: A Systematic Review
   
   University of Southern Maine
   
   AUTHORS: Keith J. Bourgeois, Nath Anderson
   
   FACULTY MENTOR: Carol Fackler
   
   ABSTRACT: Emerging evidence indicates that the analgesic effects of multimodal drug therapy that combines nonsteroidal anti-inflammatory drugs (NSAIDS) with acetaminophen may be superior to either drug alone. Because NSAIDS and acetaminophen have different mechanisms of action within the body, they theoretically can provide synergistic effects, resulting in improved pain control at reduced doses while reducing the risk of adverse effects. The purpose of this systematic literature review is to synthesize and report the most current evidence from published trials that compare the therapeutic efficacy of treating pain in adults with a combination of NSAIDS and acetaminophen versus either drug alone. A search for current evidence was completed using the MEDLINE database for the years 2000 through 2014. Eligible studies were limited to randomized controlled trials that included at least three treatment arms (acetaminophen alone, an NSAID alone, and combined therapy), and that measured pain as a primary outcome. Preliminary findings from our narrative analysis comparing and contrasting results from these studies indicate that combined therapy was significantly more effective at reducing pain than monotherapy in four of nine (44%) studies. Implications of our findings for pain management in clinical practice and recommendations for future research will be discussed.
4. Developing a Bicycle Blind Spot Sensor System  
*University of Southern Maine*  
**AUTHORS:** Henry Brown, Travis Hale, Timothy Holt, John Vandoloski  
**FACULTY MENTOR:** Mehrdad Ghorashi  

**ABSTRACT:**  
The National Highway Traffic Safety Administration (NHTSA) estimates that 49,000 road cyclists are injured and another 700 are killed by motor vehicles annually. One way to reduce these numbers is to address the blind spot issue. Research indicates that there exists no consumer device that directly addresses this matter. In this project, a working prototype of a device that improves the environmental awareness of road cyclists is manufactured. This device reduces the reaction time of cyclists by alerting them about the objects that are within both rear blind spots. This task is accomplished by a system of rear sensors. The design is to be robust enough to operate in moderately adverse weather conditions.

5. Scanning for Shell Disease: Microbes associated with a Disease of the American Lobster (Homarus americanus)  
*Southern Maine Community College*  
**AUTHOR:** Amanda Campbell  
**FACULTY MENTOR:** Brian Tarbox  

**ABSTRACT:**  
Bacteria are the most abundant microorganism detected in epizootic shell disease (ESD) lesions on the carapace of the American lobster, Homarus americanus (Meres et al. 2012). Opportunistic bacteria, present both on healthy carapace and in the environment, colonize the lesions. The specific role bacteria and other microorganisms play in forming lesions is not yet known. The microbial community within a lesion may exist as a biofilm. Biofilms are aggregations of bacteria of one or many species contained within a secreted matrix (Wahl, 2012). The biofilm acts as a multi-celled organism, with bacteria involved in unique roles. We suspect that bacteriophage and eukaryotic cells may also play functional roles in biofilms. We used scanning electron microscopy to image microorganisms on healthy and diseased lobster cuticle. The images reveal that biofilm on healthy cuticle is dominated by similar cells that are interconnected and may function as a coordinated community (Fig. 3). Microbial communities in lesions are more diverse and appear to be less coordinated (Fig. 4). This poster summarizes ongoing research at Southern Maine Community College to characterize ESD lesion communities.

6. Dinosaurs of a Feather  
*Southern Maine Community College*  
**AUTHOR:** Amanda Campbell  
**FACULTY MENTOR:** Elizabeth Ehrenfeld  

**ABSTRACT:**  
The T Rex from *Jurassic Park* is now considered to be a little less reptile-like. The image of the overgrown lizard chasing humans is now considered to look more like an overgrown flamingo. New data suggests that dinosaurs had brightly colored feathers instead of scales or rough skin. Although fossils are the main science behind the discovery, genetic analysis with chickens and other organisms shine light on the brightly colored feathers. There are many theories that they were used for mating purposes, but not for flying. Scientists have been looking into aspects such as color receptors in eyes and other traits that give rhyme or reason to the organisms expressing these genes. Research as to why dinosaurs had feathers may also help to understand the evolution of feathers in other species. This poster is a literature review of the genetic data combined with archeological findings.
7. Radio Frequency Identification (RFID) Antenna Circuit Design

*University of Southern Maine*

**AUTHOR:** Andre M. Cannetti  
**FACULTY MENTOR:** Mustafa Guvench  

**ABSTRACT:**
Radio Frequency Identification technology is a method of using electromagnetic fields to transmit and/or receive specific wave signals between two systems. Near field communication consists of a reader device and an antenna tag to radiate a signal within a unique operating frequency by use of magnetic induction. The process of this project involves the accurate set-up of an RFID reader and the fabrication of a few different RFID tag prototypes. The overall goal of this project is to design a passive RFID tag that consists of an integrated circuit chip and an antenna pattern which was generated with a standard inkjet plotter and conductive ink. The finished RFID system will display the transmission of a carrier wave from the reader to power up the tag which will send back data to the reader.

8. A Statistical Investigation of Ocean Acidification Trends and Implications on the Maine Lobster Industry

*University of Southern Maine*

**AUTHOR:** Shaun L. Carland  
**FACULTY MENTOR:** AbouEl-Makarim Aboueissa  

**ABSTRACT:**
Maine American lobster (Homarus americanus) commercial fishery is Maine’s most valuable aquaculture industry. In 2013, over 127 million live pounds of lobster was harvested in commercial Maine landings, comprising 43% of the state’s fishing industry. Ocean acidification has been identified as an imminent threat to the future of Maine’s lobster industry. Previous research has shown that American lobster larvae may respond to ocean acidification at pH levels similar to levels predicted for 2100 with reduced growth and development rates as a result of reallocation of energy to other processes. In the next 100 years, increasing atmospheric carbon dioxide levels are predicted to lower oceanic pH levels by 0.2-0.5 pH units, causing an increase in oceanic acidity. The scope of this research consisted of constructing a Box-Jenkins ARIMA model from a time series consisting of ocean acidification measurements. The time series data was obtained from the Hawaii Ocean Time Series project consisting of pH measurements from the deepwater Station ALOHA (22°45’N, 158°00’W). This model was then used to forecast changes in ocean acidification and make predictions in societal and financial terms, specifically regarding Maine’s lobster industry.

9. Impact of Low Health Literacy of Single Mothers on Child Health Outcomes

*University of Southern Maine*

**AUTHOR:** Joseph Carter  
**FACULTY MENTOR:** Carol Fackler  

**ABSTRACT:**
Single mothers are affected by low health literacy and children rely on them as sole caregivers for health-related decisions. Little attention has been paid to this population in the literature. The purpose of this project is to identify evidenced-based interventions aimed at improving health outcomes for children of single mothers with low health literacy skills. Preliminary findings suggest that single mothers with low health literacy lack knowledge and understanding regarding health conditions and preventive services. Adverse outcomes for children include parental report of poor health status and increased rates of chronic diseases. The health care community must respond by using an interprofessional approach to develop strategies to ensure single mothers receive assistance in overcoming barriers to accessing health care information and services. Nursing, social work and public health expertise would contribute to promotion of health literacy in single mothers. This approach considers knowledge deficits, parental development skills, and accessibility concerns. Outcome measures must be identified to evaluate the effectiveness of the interprofessional approach, focusing on removal of barriers for single mothers including lack of knowledge and general understanding of health care and conditions.
10. Using the Web & Social Media to Aid in Research & Interventions

*University of Southern Maine*

**AUTHORS:** Marpheen S. Chann-Berry, Dan A. Jandreau

**FACULTY MENTOR:** Carl Blue

**ABSTRACT:**
An intervention website was designed, beta-tested, and finalized through a succession of collaborative meetings between the web design team (Marpheen Chann and Dan Jandreau under the supervision of Carl Blue) and Nancy Baugh, Janet Blum, Ann Conley, Carol Fackler, and Carol Nemeroff. The Eat Move Live web portal (EML) was created to present information about three distinct categories: Eating, Moving, and Life Balance. With the aid of our faculty advisor, Carl Blue, the web design team spent the spring, summer, and fall of 2014 articulating and assessing the needs of the researchers. During this time, we developed the outline of the website, organized and incorporated the content, and aided the researchers in using it to help participants track their progress. Participants were encouraged to engage with the material offered through the website, as well as external resources that expounded on the information. This was accomplished through the use of Social Media. A tracking form was utilized to collect data on food and beverage intake, exercise, and a participant’s stress levels and sleep hygiene. The tracking form was switched out every week on Sundays to ensure that one week’s data was kept separate from data from other weeks.

11. Self-Charging Footwear

*University of Southern Maine*

**AUTHORS:** Alyssa Chaplin, Timothy Libby, Christian Melson, Bethany Snow

**FACULTY MENTOR:** Mehrdaad Ghorashi

**ABSTRACT:**
The hustle and bustle of a high-speed society cause many people to retreat to the wilderness to escape and reset. Yet, because they are so accustomed to being connected, it is sometimes hard to adjust completely from the city to the outdoors. This is because electricity has become a necessity in the modern world. Those who spend a lot of time in nature still prefer to remain connected with a phone or a GPS system. In this project, to provide the power that is needed to run these devices, energy is harvested from the motion of the active human. Specifically, using piezoelectric elements, a standard outdoor boot is transformed to charge a battery by the repeated bending forces imposed by walking feet. Although the design does not deliver the energy needed to charge a device on a regular basis, it provides the user with a sense of security knowing that there is always enough energy in the shoe to make an emergency call or power a flashlight.

12. USM Composers Ensemble

*University of Southern Maine*

**AUTHORS:** Aaron Clarke, Shannon Allen, Lori Arsenault

**FACULTY MENTOR:** Daniel Sonenberg

**ABSTRACT:**
The USM Composers Ensemble is a chamber orchestra averaging 20 members from semester to semester, comprised of both performers and composer-performers. Over the course of each semester, composers develop pieces towards a concert of new works at semester’s end. All members are encouraged to write, and it is required of composition majors. The ensemble provides unique opportunities to composers, including the ability to write for large ensemble, the chance to hear works rehearsed regularly and performed, and intensive education in writing and preparing parts for individual instruments. Biweekly rehearsals allow composers to bring in experiments and test different musical ideas. This testing engenders continuous refinement of the composer’s skills, which strengthens the finished products. Additionally, each member of the ensemble educates by sharing information about the instruments or concepts in which they have expertise. About a month before the concert, the general focus shifts from experimentation to completion of parts and intense rehearsal. This semester, the Composers Ensemble is celebrating its 10th anniversary by commissioning works from 10 alumni of the group, which will be performed alongside new compositions from current members. In celebration of the anniversary, composers have 10 as a prompt to use in the construction of their compositions. This can take the form of more strict theoretical occurrences of 10, or more direct appearances (having a musical line repeat 10 times, for example).
13. Vibro-Acoustic System  
*University of Southern Maine*  
**AUTHORS:** Hayley Clavette, Jacob Fowler  
**FACULTY MENTOR:** James Smith

**ABSTRACT:**  
The goal of this project was to design and fabricate a mechanical noise generator using a mechanical wave driver. This apparatus was designed to record the mechanical and acoustic vibration spectra of a circular test plate using an accelerometer and a condenser microphone. The frequency of vibration was controlled using a wave generator, and was based on the resonance frequencies that were determined using SolidWorks simulations and experimental observations. The collected data was then analyzed and compared using Mathematica and the Discrete Fourier Transform. Mode shapes were also investigated by comparing SolidWorks simulation results to our observations.

14. Hip Flexors: The Unpopular but Prevalent Thorn in Our Sides  
*University of Southern Maine*  
**AUTHORS:** Nathan Colpitts, Kathleen Grinvalsky  
**FACULTY MENTOR:** Dr. James Schilling

**ABSTRACT:**  
The purpose of this project is to spread awareness and educate professional and athletic populations about hip flexor strain prevalence, and incorporates injury preventative and beneficial methods for rehabilitation. This protocol can be applied to anyone that suffered a mild-moderate hip flexor strain. The sources of the literature include the following databases: Pubmed, Medline, Pedro, Google Scholar, and NATA.org. Strains are soft tissue injuries involving micro-tearing of muscle fibers. The severities that we discuss range from mild-moderate (grades I and II, respectively). Our protocol focuses rehabilitation in this order: RICE for acute care, static and PNF stretching, strengthening, neuromuscular control, plyometric, functional, and agility exercises. In order for the patient to return to play, they must meet the protocol criteria. The goal is to get the patient returning to play as quickly as possible with no limitations, and to decrease re-occurrence incidences. Past protocols do not properly assess neuromuscular control or improve the injury-preventative strength that needs to be established. Based off recent research providing a neurological approach with rehabilitation, we chose to attack the leading cause of these injuries correctly, ultimately leading to the desired goal. In conclusion, this research provides further education as to why these injuries occur; also a more affective protocol for clinicians to implement on hip flexor strain occurring within active populations.

15. Is Industrial Hemp a Feasible Redevelopment Tool for Maine’s Rural Economy?  
*University of Southern Maine*  
**AUTHOR:** Bradley Cuddeback  
**FACULTY MENTOR:** Susan Feiner

**ABSTRACT:**  
Industrial hemp, that is any variety of the plant Cannabis sativa L with a delta-9-tetrahydrocannabinol concentration of no more than 0.3% on a dry weight basis, is on the verge of a major comeback. With its success already proven in Canada, the once widely planted crop is close to coming back to the United States. This is a great opportunity for the farmers and economy of the state of Maine, as industrial hemp has been documented has having thousands of uses. However, there are several unknowns about the crop that must be answered before large scale production can begin, such as growing requirements, like climate and soil composition, potential markets, the cost of production, potential yields of the crop, and expected net return, among others.
16. Inside Out: Topological Properties of the Klein Bottle  
*University of Southern Maine*  
**AUTHORS:** Jennifer Daigle, Deirdra Brown, Andrew Pogg  
**FACULTY MENTOR:** Laurie Woodman  

**ABSTRACT:**  
A Klein Bottle is a two-dimensional manifold in mathematics that, despite appearing like an ordinary bottle, is actually completely closed and completely open at the same time. The Klein Bottle, which can be represented in three dimensions with self-intersection, is a four-dimensional object with no intersection of material. In this presentation we illustrate the geometric properties of the Klein Bottle, use the Möbius strip to help demonstrate the construction of the Klein bottle, and use topology to prove that the Klein Bottle intersection that appears in R3 does not exist in R4.

17. Improving Health Literacy in Populations with Limited English Proficiency: An Interdisciplinary Approach  
*University of Southern Maine*  
**AUTHOR:** Ashley B. Dasch  
**FACULTY MENTOR:** Carol Fackler  

**ABSTRACT:**  
Introduction: Health literacy, or the ability to obtain, process, and act on health information, is essential to one’s health. Health literacy in the US relies heavily on the ability to communicate in English, making health literacy a significant issue for those with limited English proficiency (LEP). Literature Review: Health literacy is a greater predictor of health status than any other patient characteristic such as education or income. LEP patients often struggle to understand and apply health information in English, increasing their risk of making poor health decisions. As language and health literacy are strongly correlated with health outcomes, poor health literacy is a major social determinant of health for those with LEP. Implications: Collaborating with professionals whom assist the LEP population in the community, healthcare providers can adapt health education materials and programs for those with LEP, acknowledging communication barriers and facilitators. Proposed Interprofessional Approach: An interprofessional approach that fosters health literacy in those with LEP would involve healthcare providers, community leaders, and adult educators. This approach must increase health literacy empowerment, while accounting for healthcare providers’ assumptions regarding health literacy in those with LEP. Evaluation: Appropriate outcome measures must be identified to evaluate the efficacy of the interprofessional approach, accounting for the cultural differences present in subgroups of the LEP population.

18. Exercise Rehabilitation of the Ulnar Collateral Ligament of the Elbow  
*University of Southern Maine*  
**AUTHORS:** Samantha A. Davol, Michaela Despins  
**FACULTY MENTOR:** James Schilling  

**ABSTRACT:**  
This project illustrates a therapeutic exercise rehabilitation program for an athlete to complete in order to progress to return to play status. The protocol created is for a baseball pitcher who is working to return to play after suffering from an Ulnar Collateral Ligament Sprain. The sources used for the protocol include NCBI, JOSPT, EBSCO, Current Orthopedic Practice, etc. Ulnar Collateral Ligament Sprains are often common in overhead throwing athletes such as baseball pitchers. The UCL of the elbow usually receives large amounts of stress due to the increase amount of repeated valgus force on the elbow joint during the late cocking phase of a pitch. If an athlete suffers from an UCL sprain the following protocol should be followed in order to return to play. Range of motion, muscular strength, neuromuscular control, plyometrics, and agility of the elbow should be assessed. This progression should be followed until the athlete can complete all exercises correctly without pain, following which they can return to play. This conservative method provides therapeutic exercises that will allow the athlete to return to play without the need of more invasive surgery and post-op surgical rehabilitation methods. This UCL sprain rehabilitation protocol provides an effective method for clinics to use with athletes in hopes of avoiding surgical methods.
19. Application of Control for Optimization of Irrigation  
*University of Southern Maine*  
**AUTHORS:** Patrick Doyle, Emily Donovan, Christopher Dunn, Samuel Ludwig  
**FACULTY MENTOR:** Mehrdad Ghorashi  

**ABSTRACT:**  
The goal of this project is to build an intelligent irrigation system. In this system, by the collection and analysis of the environmental variables such as air temperature, light exposure and soil humidity, automated irrigation is optimized. In this way, the amount of water provided to the plant can be optimized. The ultimate goal is to create a system that maintains a plant in optimal health while conserving clean water. The developed prototype is used to water a peace lily. The temperature, light and humidity information are logged and assessed by a central processing unit which actuates the watering system when predetermined conditions are met. The device has been used as the basis of an experiment. A fourteen day trial has been conducted in which the system was left alone to water the peace lily. The results have been compared against corresponding results for multiple control plants watered using various techniques, while sharing the same environment. Over the fourteen day period, environmental data was gathered and general plant condition was observed. This device has the potential to be scaled up and mass-produced as to provide an intelligent and optimized irrigation system. This will enable the user to conserve water while facilitating plant care.

20. Fresh Start  
*University of Southern Maine*  
**AUTHORS:** Meghan M. Dube, Katherine O. LaGassie  
**FACULTY MENTOR:** Holly J. Bean  

**ABSTRACT:**  
According to the CDC (2012), there has been a 20% decrease in hospital admissions for myocardial infarctions and an 11% decrease in hospital admission for pulmonary disease since the emergence of smoke-free facilities. The CDC (2012) also indicates that non-smokers are more productive, take fewer sick days per year, and use fewer health care resources than smokers. Fresh Start is a six-week psychoeducational and holistic wellness program with a focus in addressing smoking cessation in adult-age current smokers who are struggling to reduce and/or eliminate tobacco use due to intrinsic resistance. This wellness program is intended for businesses and public institutions that are moving into a smoke-free milieu. Program participants will examine the harmful effects of tobacco use through PowerPoint presentations on the toxins within cigarettes, the health implications of smoking, and the chemical basis of addiction and withdrawal. To develop the program, Fresh Start conducted a needs assessment survey (N=30) to determine what the community’s needs are in a smoking cessation program. Based on the results, Fresh Start tailored its content to reflect upon behavioral management and social environment tips, physical activity, nutritional guidance, and withdrawal aid. Throughout the six-week duration, participants will be introduced to a rotation of mindfulness techniques, positive affirmations, dietary plans, low impact activity, and more to promote successful reduction and/or elimination of tobacco use.

21. Experience a Cyber Event  
*University of Southern Maine*  
**AUTHORS:** Eric Dubois, Alex Weeman  
**FACULTY MENTOR:** Glenn Wilson  

**ABSTRACT:**  
The objective of this project is the creation of a portable demonstration environment where people can experience various cyber attacks and cyber threats with the goal of understanding and the methods to recognize and protect. Participants will have a laptop assigned to them and will experience hands-on events such as denial of service (DOS) attacks, domain name service (DNS) attacks, email phishing, proper router configuration, packet capture, and credit card theft. In essence, the main outcome is to change behavioral habits of internet users in hopes of bringing a safer and more secure browsing experience.
22. Hematology System Performance from Patient Results Analysis

*University of Southern Maine*

**AUTHOR:** David W. Ericson  
**FACULTY MENTOR:** Clare B. Congdon

**ABSTRACT:**
Hematology is the branch of medicine concerned with physiology, morphology and pathology of the blood. Veterinarians routinely analyze blood samples from pets to determine a general status of the health of the patient. IDEXX Laboratories Inc. provides the LaserCyte® Dx hematology analyzer to the veterinary market. The LaserCyte analyzer is a complex instrument requiring delicate tuning of many parameters. Due to the sensitivity of the instrumentation, individual instruments can have subtle different characteristics from other analyzers; but there are limits regarding the variation as the algorithms depend on these parameters to derive accurate results. IDEXX has a technical help center that will receive patient results from customers to assist them in the diagnosis of instrumentation problems. To increase instrument reliability and to preemptively head off issues with fielded analyzers, results data will be analyzed to determine instrument health. A machine learning application will be developed to determine the characteristics of collective and individual instruments. The application will recommend service or replacement of the analyzer to the customer support user, replacing the role of the few humans qualified to perform this task.

23. Examining the Relationship between Stem Cell Transplantation in Krabbe Disease and Neonatal Outcomes: A Systematic Review of the Literature

*University of Southern Maine*

**AUTHORS:** Donna L. Fletcher, Andrea Carr  
**FACULTY MENTOR:** Carol Fackler

**ABSTRACT:**
Introduction: Krabbe disease, a rare lysosomal storage disorder that occurs in approximately 1 in 100,000 live births, causes severe deterioration of cognitive and motor skills and eventually results in death during early childhood. Early detection of Krabbe disease is possible as part of the routine newborn screening, but it is not part of the recommended uniform screening panel because of a lack of research supporting the benefit of its early detection including the efficacy of treatment (stem cell transplantation). The search strategy utilized the following databases: MEDLINE, CINAHL and Cochrane. Search terms included (Krabbe Disease or Leukodystrophy, Globoid cell) AND (transplant* or Hematopoietic stem cell transplant*). The final sample of 10 research studies met the inclusion criteria: primary research studies conducted on humans; and research published in English between 1998 and 2015. Preliminary findings suggest that stem cell transplantation can help slow the progression of this disease, especially if performed very early in life. Based on the findings the authors will be presenting recommendations related to newborn screening, health provider education, and more research in this very specialized area of clinical diagnosis and treatment.

24. Toward a Culture of Design in the Writing Center

*University of Southern Maine*

**AUTHORS:** Sam Fletcher, Ben Gauthier, Emma Schalk, Vic Shalk  
**FACULTY MENTOR:** Pat Hager

**ABSTRACT:**
In the Writing Center at the University of Southern Maine, Lewiston-Auburn College, the peer tutor staff engages in continuous discourse about composition and how we work with writers. We find that many students are unable to invest in the creative process necessary to all writing, and that their confidence and ability to fulfill the writing requirements may suffer. When a writer’s poor self-concept and the pressure to conform to a linear writing process converge, creativity halts, and the student often finds herself unable to achieve. To address this issue, we are incorporating James P. Purdy’s analysis of design thinking in composition studies. By prompting students to approach academic writing as design, we can foster the writer’s growth, and begin to collaborate in an empowering learning environment. As a result, we are developing
long-lasting relationships with writers who use metacognition to create their own viable learning processes. This change is ongoing and slow. We’ve seen some success with individuals, but others still fail to see the Writing Center as a place to ideate. As we work to impact the culture of writing at USM LAC, we must urge students and faculty to see the Writing Center as a locus of creation and strengths development. This project traces our implementation of design theory and its effect on the way we engage with student writers and our attempt to disrupt listless process approaches to writing. Our goal is re-imagine writing in a way that honors limitless possibilities.

25. Perceptions of Substance Abusers
*University of Southern Maine*

**AUTHORS:** Heidi G. Franklin, Wendy L. Frayer, Kayla J. Harding, Nicole E. Labonte

**FACULTY MENTOR:** Charles Smith

**ABSTRACT:**
Millions of Americans use drugs and alcohol every day. Everyone has a different view on this problem and the extent to which it is a problem. Some of the questions that came up for us and that have been influential as we are exploring this issue are: Is it a problem for the individual, for society, for the community, and who is responsible for funding services to reduce the problem? Does it matter what public opinions are in regards to how benefits, treatment services and the criminal justice system interact with people dealing with addiction? Can public opinion be changed by education? How does the need to pay for services impact who wants to pay and their views of needed services and repercussions of using substances. Do people’s views of substance abuse/misuse differ based upon whether we are discussing alcohol, marijuana or hard drugs? The study itself is a randomized experimental design using an on-line cross sectional self-administered survey distributed via snowball sampling. Research questions include: 1) can messages or information targeting System I cognitive processes (Kahneman, 2012) such as emotionally laded messages produce more changes in perceptions than System II cognitive processes (i.e., rational, factual)?, 2) do individuals with prior exposure to substance abuse have greater empathy for substance abusers after controlling for other factors?, and 3) what other personal factors (i.e., age, educational, political orientation) are related to perceptions of substance abusers?

26. Lateral Ankle Sprain Therapeutic Exercise Rehabilitation
*University of Southern Maine*

**AUTHORS:** Jennifer N. Fuller, Cody J. McFarland

**FACULTY MENTOR:** Jim Schilling

**ABSTRACT:**
The purpose of this project was to create a rehabilitation program using therapeutic exercise to enable quicker recovery from a lateral ankle sprain. The subject focus was on a male basketball player. A lateral ankle sprain is the most common ankle injury. There are 3 ligaments that attach the lower leg to the foot, the Anterior Talofibular ligament, Calcaneofibular ligament, and Posterior talofibular ligament. These 3 ligaments are often injured or torn in a lateral ankle sprain. This injury occurs when the foot inverts or “rolls” inwards and stretches the ligaments. The treatment strategy comprised of a protocol including various factors: reducing inflammation, increasing range of motion of the joint, and increasing sensorimotor control and proprioception of the ankle, which are vital in preventing recurrence of injury and instability, as well as focusing on strength, plyometric, and agility exercises followed by a return-to-play protocol. This conservative management protocol is the most effective for this injury because not only will it get the individual back to playing, but these exercises will help prevent future injuries from occurring. In conclusion, the research regarding this topic provided valuable information for health professionals to administer the best treatment to patients affected by lateral ankle sprains.

27. A Computational Tool to Extract Regions of Interest from Genomic Sequences
*University of Southern Maine*

**AUTHORS:** Brenna A. Gardner, Clare Bates Congdon, Craig R. Lessard, Samuel McFarland

**FACULTY MENTOR:** Clare Bates Congdon
**ABSTRACT:**
We are developing a software tool, DNA Sequence Curator (DSC), to expediently create data sets for computational genomic investigations. The human genome is roughly three billion base pairs long, with approximately 95% of the genome containing noncoding regions. These regions contain features that regulate gene expression, including those that can play a role in human health and disease. Computational investigation of noncoding DNA can assist those in the biological sciences in identifying regulatory regions of interest. However, the existing methods for manually collecting noncoding regions are time consuming to use and prone to human error. DSC takes advantage of publicly available data to collect regions of interest in a fraction of the time required by lengthy manual techniques. More specifically, DSC utilizes two types of files, the first containing gene location information, and the other, raw sequence data. These files include gene annotations in addition to intergenic sequences and other features. DSC will allow computational investigations of genomic regions to proceed much more efficiently. We expect this tool to be of interest to bioinformatics researchers worldwide.

**28. Heat Transfer/ Fluids Lab Design**
*University of Southern Maine*
**AUTHOR:** Bruce Gerry  
**FACULTY MENTOR:** Lin Lin

**ABSTRACT:**
This project consists of the designing, building, and creation of instruction manuals for several labs in the fluids and heat transfer fields. Labs for these fields tend to be large and hard to simulate as a physical models. This project will solve that problem by creating simulations in solidworks. Not only will simulations in solidworks make some concepts possible to demonstrate but, it will also expose students to useful software that they will see out in the workforce.

**29. The Efficacy of Telepsychiatry in the Treatment of Depressed Adults: A Systematic Review of the Literature**
*University of Southern Maine*
**AUTHORS:** Devon Gillis, Ian Adams  
**FACULTY MENTOR:** Carol Fackler

**ABSTRACT:**
Depression is a common psychiatric disorder with a high prevalence of under-treatment. Access to psychiatric services can be a challenge for many, such as those living in rural communities. Telepsychiatry has been used to treat those unable to access traditional face-to-face services. The purpose of this systematic literature review is to examine current evidence exploring the efficacy of telepsychiatry compared to face-to-face modalities in the treatment of depressed adults. The search strategy utilized the databases Academic Search Complete and PsycINFO. Keywords included: telemedicine, telepsychiatry, depression, and adult. A final sample of 10 research studies met the inclusion criteria of studies in which telepsychiatry was compared to face-to-face treatment for adults with depression. The studies showed a significant improvement in depressive symptoms with the use of both telepsychiatry and face-to-face intervention. Overall, telepsychiatry interventions for depression may be as beneficial when compared with face-to-face delivery, though not superior. The findings support the efficacy of using telepsychiatry in providing interventions for the treatment of depression. Health care leaders and policymakers should be educated about this modality and encouraged to support, administratively and financially, the use of telepsychiatry for underserved communities.

**30. The Relationship between Emergency Department Nursing Staff Education and Psychiatric Patient Length of Stay: A Systematic Literature Review**
*University of Southern Maine*
**AUTHORS:** Amanda Graber, Kathleen Hennessey  
**FACULTY MENTOR:** Carol Fackler
ABSTRACT:
The number of psychiatric patients seeking psychiatric help in the Emergency Department has increased greatly, often leading to long wait times. In many areas of health care, education of nursing staff has been shown to improve patient outcomes, decreasing infection rates is one example. The purpose of this systematic review is to examine the current evidence on the relationship between psycho-education for emergency department nursing staff and psychiatric patient length of hospital stay. The search strategy utilized CINAHL, PsychINFO, PsychARTICLES, and PubMed databases. Keywords included psychiatric, education, emergency care, nurses, length of stay, psychiatric emergency. The final sample of six studies met the inclusion criteria of studies with participants 18 years old and older, studies reported in English, and studies published within the last 10 years. Preliminary findings indicate a positive relationship between emergency department nursing staff education on psychiatric disorders and their treatment and decreased patient length of stay. Implications from this review for practice, policy, education, and future research might include recommendations for creating policies requiring psycho-education for nursing staff, developing and implementing education, and future research on the relationship between staff education and patient outcomes.

University of Southern Maine
AUTHOR: Kyle M. Green
FACULTY MENTOR: Mehrdaad Ghorashi

ABSTRACT:
Quad-rotor drones are quickly being adapted for many uses across many industries ranging from military applications to aerial photography to search and rescue tools. To improve their usefulness, drones will need to be able to carry more equipment and stay in flight longer. Improving the aerodynamic design of the rotor blades will allow drones to create more lift using less energy. In this project, the performance of a quad rotor drone has been analyzed and specifically, its lift force has been measured. Then, as an application of the vacuum bagging system the student co-developed in the fall semester of 2014, and using SolidWorks, modified rotor blades were designed, manufactured, and tested. The lift force generated by the new rotors has been measured and compared with that of the original rotors of the drone. The experimental and simulation results have been compared to validate the results. It is expected that the modified rotors provide greater lift and reduced specific power consumption.

32. Identification and Characterization of Soil Bacteria Capable of Growth on Triclosan
University of Southern Maine
AUTHOR: Jason M. Greenbaum
FACULTY MENTOR: Rachel Larsen

ABSTRACT:
Triclosan (2,4,4’-Trichloro-2’-hydroxydiphenyl ether) is a synthetic antimicrobial commonly used in many household products such as hand soap, toothpaste, and beauty products. The widespread use of triclosan has led to an accumulation in our water and in the environment as a pollutant. This study aims to evaluate the prevalence of bacteria capable of metabolizing triclosan. Triclosan is insoluble in water and experiments were conducted to optimize the conditions of minimal media to improve solubility. Soil samples collected around southern Maine were inoculated in a rich media containing triclosan and followed with an enrichment using a minimal media containing triclosan. The enrichment was conducted in order to encourage the growth of bacteria that are capable of growing on triclosan and extract them from the numerous other microbes found in the environment. Bacteria that we isolate will be placed onto agar media containing triclosan and then identified using DNA sequencing. A subsequent goal of this research is to pinpoint the genes encoding the proteins associated with this metabolic process in these bacteria. This will be done using a technique known as transposon mutagenesis. In summary, bacteria that are capable of metabolizing triclosan may greatly benefit the environment through bioremediation of waste water.
33. Heat Exchanger For Home Brewing Project  
*University of Southern Maine*  
**AUTHORS:** Seth Greene, Bruce Gerry  
**FACULTY MENTOR:** Lin Lin  

**ABSTRACT:**  
Annually, breweries in the United States spend over $200 million on energy. Energy consumption is equal to 3-8% of the production costs of beer, making energy efficiency improvement an important way to save energy and reduce cost. This project is focus on home brewery energy improvement since recycle and reuse energy are not practical for these small scale not constantly running system. The task of this project is to design, build and analyze a wort chiller whose performance would be nearly the same as a plate chiller, and roughly 50% cheaper than a normal high quality brewing plate chiller. A double pipe counter flow heat exchanger with forced water injection was designed and manufactured. A small pump which is designed to handle the high temperatures of the wort was used to circulate wort through the inner pipe and exit in a manner such that it creates turbulence in the kettle allowing for a more efficient heat transfer. Testing was performed to compare our newly designed heat exchanger with a commercially available wort chiller. Testing resulted in the newly designed heat exchanger performing almost a third better than the standard home brewing immersion chiller, both in time and in water used.

34. Frozen Shoulder  
*University of Southern Maine*  
**AUTHORS:** Harrison A. Hall, Darrell St. Jean  
**FACULTY MENTOR:** James Schilling  

**ABSTRACT:**  
The purpose of this project is to inform about the most effective therapeutic exercise treatment protocol for frozen shoulder (adhesive capsulitis). Adhesive Capsulitis is an idiopathic condition where the connective tissue around the glenohumeral joint suddenly inflames causing stiffness and pain within that joint. This pain onsets a progressive decrease in range of motion (ROM) throughout the first two stages. The first stage, freezing phase, is where most ROM is lost and can be very painful. This lasts from 2-9 months. The second stage, frozen phase, lasts anywhere from 4-12 months, and the subject may begin exercise therapy with cortical injections to break up adhesions and scar tissue. The last phase, thawing phase, is when the subject starts to see increase in ROM and can last from 5-26 months. During the freezing phase there is limited therapy besides corticosteroid injections. The frozen phase rehab has shown success with a distension technique: inject fluid into capsule to break up scar tissue. Manual therapy and exercise interventions also help to gain ROM and restore muscle mass. The final phase of thawing is where athletic trainers can be most beneficial. This is the best rehab protocol because frozen shoulder needs to be treated within the second and third phases. Exercises have been shown to improve ROM dramatically through the help of corticosteroid injections. These injections are for breaking up adhesions and scar tissue.

35. Therapeutic Exercises Protocol for the ACL Tear  
*University of Southern Maine*  
**AUTHORS:** Matt Harding, Jessica Herrera  
**FACULTY MENTOR:** James Schilling  

**ABSTRACT:**  
The purpose of this poster was to construct a conservative treatment protocol for an ACL tear using therapeutic exercise carried out before a return to play. The protocol was for a women’s lacrosse player who suffered an ACL tear, the most common injured ligament in the knee. The injury occurs mostly in the young active sports population. The treatment strategy to improve ROM of the knee would include the following exercises: wall sides, chair squats, sitting extension, and prone extension. We want to improve ROM of the knee because the exudate fluid limits extension and flexion at knee. We would strengthen the knee using static hamstring holds and static quads standing. Plyometric exercises help the athlete get stronger using double leg target jumps. As an example, an agility exercise to help would be the
Developing Functionality for Microbots in Java and Eclipse

University of Southern Maine

AUTHOR: Samuel Harmon
FACULTY MENTOR: Carlos Lück

ABSTRACT:
The main goal of the project is to work with the microbots to develop functionality with the Java programming language and the Eclipse Integrated Development Environment (IDE). Not only does this demonstrate an understanding of robotics and programming, it will be useful to future students who will have the options to develop programs in multiple languages and platforms. The first step of the project will be to set up the laboratory computers with eclipse and develop the skeleton code, originally in c/c++, in Java/Eclipse. This will require becoming familiar with java programming methods to utilize serial communication with the use of the windows API. The original program has also been integrated into the Eclipse c/c++ environment to provide multiple development options and to become familiar with the differences in development environments. Next, I have demonstrated all the projects required of the EGN 317 course in the different environments and debug as necessary. Since the Robotics course coincides with my project I have been available to the students to assist with syntax and environment issues. Also, a hyperterminal application has been developed for programmers to use for easy serial communications tests. Finally, I have completed a comparison of the C and Java programming languages based on the experience of this project.

Conservative Treatment of Knee MCL Sprain

University of Southern Maine

AUTHORS: Kaleigh A. Heath, Rose Lowell, Sabrina Sodders
FACULTY MENTOR: Jim Schilling

ABSTRACT:
The purpose of this project is to explore a rehabilitation process of medial collateral ligament (MCL) sprain of the knee. This protocol can be used for all ages and athletes who suffer from acute/chronic MCL injuries. The sources of literature searched included the following; EDSCO, The American Journal of Sports Medicine. The importance of this project is due to the pressing issues of lower extremity weakness among college and high school athletes. A majority of these injuries are due to valgus stress on the lower extremity. Following rehabilitation plans, 96% returned to play with no physical discrepancy. The protocol will address weakness throughout the lower extremity. The primary exercises of the protocol focus on neuromuscular control to improve reflexes and balance. The secondary exercises will address strength within the lower extremity and power training. Strengthening the lower extremity will address the instability of the joint and power training will increase sensitivity of proprioceptors. The final exercises will focus on agility and sport specific exercises to ensure the athlete is ready to return. This sequence of exercises is effective because it will target all aspects of rehabilitating the MCL. The return to play criterion assesses sensorimotor control, strength and power, and agility to ensure the athlete is completely ready to return. Overall, the protocol will be put in place to rehabilitate a patient back pre-injury functions, or as close as possible depending on the severity of injury.

Water Vapor Uptake Across the Cocoon Wall of the Introduced Pine Sawfly (Diprion similis (Hartig)) Hymenoptera: Diprionidae

University of Southern Maine

AUTHOR: Elizabeth F. Henderson
FACULTY MENTOR: Joseph K. Staples
ABSTRACT:
For many holometabolous insect species, pupation occurs within the protected walls of a tightly spun silken cocoon. It is generally accepted that the cocoon provides the inhabitant with a means of avoiding harsh environmental conditions while offering protection from predators or pathogens during this vulnerable developmental period. Cocoons were collected from Eastern White Pine (Pinus strobus L) saplings growing in Windham, Maine and returned to the laboratory at the University of Southern Maine in Gorham. In an attempt to better understand directionality of diffusion of water vapor across insect cocoon walls, we measured the rate of water uptake or loss in overwintering Pine Sawfly (Diprion similis (Hartig)) cocoons. Results show that the relative rate of diffusion is greater when water vapor is moving from the outer surface of the cocoon to inner surface compared to the opposite direction. Additionally, observations made using scanning electron micrographs of the cocoon wall show a greater silk fiber density for the inner surface as compared to the outer surface. These results provide additional insight that may further explain how the physical properties of insect cocoons, with their high surface area to volume ratio, can help to maintain water balance in a variety of environmental conditions.

39. Design and Manufacture of a UV-LED Water Purifier
University of Southern Maine
AUTHORS: Michael P. Henry, Tom Borges, Adam Simpson
FACULTY MENTOR: Mehrdaad Ghorashi

ABSTRACT:
One of the major causes of human mortality in the developing world is the scarcity of clean and safe drinking water, also known as potable water. Potable water has minimal levels of physical, chemical, and bacteriological contaminants. Many water purification technologies are expensive and consume too much power. That is why they cannot be used effectively in rural and less developed regions of the planet. The low-power solutions generally require expensive and time-consuming filter maintenance. By focusing on sustainability and cost efficiency, in this project a water purification system powered by a battery-free hand crank generator is developed. Water enters the system manually through the top, and will be pulled through by gravity as a means of eliminating the need for a pump, reducing the power requirements and cost. Water flows through a sediment filter to reduce turbidity and is then subjected to ultraviolet radiation to destroy any waterborne pathogens it may contain. By using both standard sediment filtration and UV purification techniques, our goal is to produce potable water with a total concentration of less than 0.01% E. Coli bacteria.

40. Do Bacteria Carry the Newest Gene Editor?
Southern Maine Community College
AUTHOR: Mark Hurd
FACULTY MENTOR: Elizabeth Ehrenfeld

ABSTRACT:
In 1987 Yoshizumi Ishino and colleagues at Osaka University sequenced the iap gene of Escherichia coli as well as some of the DNA surrounding the gene hoping to elucidate the proteins that turned the gene on and off. What they found were five identical segments of DNA composed of the same twenty-nine bases. These segments were separated from each other by thirty-two base blocks, each with a unique sequence called spacers. It wasn’t until 2002 that this sandwiched structure was named: clustered regularly interspaced short palindromic repeats or CRISPR. Three years later scientists noticed something in the spacers, the sequences resembled viral DNA. It was believed that CRISPR associated enzymes grab fragments of the viral DNA and inserted the fragments into the CRISPR sequences. In the following literature review I hope to establish how CRISPR can be used to edit the genomic sequence of bacterial DNA enabling the microbes to inherit the adaptive immune system. To test this hypothesis, Streptococcus thermophilus was infected with two strains of viruses and selected for resistance. The resistance strains were found to have integrated viral DNA into the spacers. Once the spacers were removed, the bacteria lost their resistance. Using this technique scientists have been able to snip DNA anywhere they want and insert new genes into the space created.
41. Supportive Exoskeletal Aides for the Physically Challenged: An Initial Investigation into the Fundamentals and Rudiments of Building a Full-Body Exoskeleton  
*University of Southern Maine*  
**AUTHOR:** Mark G. Jacobs  
**FACULTY MENTOR:** James V. Masi  

**ABSTRACT:**  
The purpose of this study is to provide methodology for designing exoskeletal prostheses targeted to specific pathologies associated with: Cerebral Palsy, Limb Deficiency, Spinal Pathologies and Functional Limb Pathologies. This study will extend to whole body exoskeletal structures. The project will be performed in conjunction with Shriners Hospital for Children in Springfield, Massachusetts, M.I.T. Bio-prosthetic Group, and finally, Massachusetts General Hospital Orthopedics Group. Further work will be done designing the necessary components for the project in Solidworks utilizing a 3D mannequin. The parts will then be fabricated using a CNC machine, first making them from foam insulation, then from wood and finally from aluminum.

42. Learning from Ambiguity  
*University of Southern Maine*  
**AUTHOR:** Ryan H. Johnson  
**FACULTY MENTOR:** Wayne Cowart  

**ABSTRACT:**  
Ambiguity, something that occurs when words and phrases can be interpreted in multiple ways, is a common occurrence in natural language. One might think that this could be confusing and detrimental, but this is not the case. Language systems often disambiguate, or solve, ambiguities without trouble through the use of the structures and systems in place. Structural ambiguity allows us to investigate how the brain structures sentences and constructs relations between the elements of sentences. This presentation will focus on ambiguous phrases like "kissing mothers," which is either an adjective-noun structure (mothers who kiss) or a verb-object structure (to kiss mothers). My presentation will explore the effect of the relative pronoun which following this structure. Which only works with the verb-object parse, and therefore can, on its own, disambiguate the structure preceding it. My hypothesis is that "which" immediately disambiguates the ambiguous phrase. My experiment will require subjects to read a verb after they hear a sentence beginning with the structure of interest. The verb form (singular or plural) will match one of the two interpretations of the ambiguous phrase. The timing of the onset of speech will be interpreted as an indication of which parse the subject chose. My hypothesis predicts that the presence of which will facilitate the production of the singular verb form.

43. PCI Compliance: An External Evaluation  
*University of Southern Maine*  
**AUTHORS:** Nicole Kearns, Kimberly Reali  
**FACULTY MENTOR:** Glenn Wilson  

**ABSTRACT:**  
The PCI-DSS standard was created by the credit card industry to address the need for the existence of a uniform standard for businesses to follow to protect sensitive credit card information. Credit and debit cards are a commonly accepted form of payment. The PCI Compliance standards need to be general enough to be applicable across multiple industries, but flexible enough to account for diversity of business sizes. The PCI-DSS standards are an evolving standard to account for the changes in technology and the threat landscape. Unfortunately, businesses struggle to stay in compliance and in 2014 businesses of various sizes were breached. The purpose of this research is to analyze the challenges business face in reaching compliance and the gap between security and compliance. In doing so, this project will evaluate the PCI-DSS standards from an external perspective where we will investigate not only the various threats to the business network, but also the tools and companies available to assist the business in reaching compliance.
44. Chew On This  
*Southern Maine Community College*  
**AUTHOR:** Christopher T. Keister  
**FACULTY MENTOR:** Elizabeth Ehrenfeld  

**ABSTRACT:**  
Adults who experience tooth loss, a condition known as edentulism, are at risk of bone deterioration of the mandible and decreased nutritional absorption. This poster is a literature review that focuses on how a bioengineered tooth and its transplantation could restore normal tooth function and health. Experiments have shown that bioengineered tooth germ was successfully generated with the formation of hard tissue, root extension and the necessary periodontal tissue and alveolar bone. Genes that control the formation of supernumerary teeth have also been targeted to produce “tooth-like structures”. Gene therapies that manipulate tooth regeneration in endogenous dental cells in conjunction with targeting the third dentition have shown to be a promising approach as well. These results indicate that bioengineered teeth may be used in the future as regenerative therapies to treat people with edentulism.

45. "Not in My Back Yard": Vested Interest, Oppositional Behavior, and Collectivism versus Individualism  
*University of Southern Maine*  
**AUTHORS:** Daniel J. Kelly, Grace Hachey  
**FACULTY MENTOR:** Bill Thornton  

**ABSTRACT:**  
The "not in my backyard" (NIMBY) phenomenon is a negative cognitive-affective and behaviorally oppositional reaction to a proposed change that is perceived to have adverse personal consequences. NIMBY is a function of vested interest, with higher vested interest (i.e., personal stake) resulting in higher behavioral opposition. College undergraduates (n = 112) completed questionnaires assessing attitudinal and behavioral opposition given the prospect of senior comprehensive examinations, proposed as either being implemented before graduation (i.e., high vested interest), or after (i.e., low vested interest). Participants were then measured according to their general cultural disposition (i.e., collectivist or individualist). Multiple regression analysis was used to determine the predictive power of cultural disposition according to high vs. low vested interest on NIMBY response (i.e., behavioral opposition). In the low vested interest condition, cultural disposition was not significant. In the high vested interest condition, however, collectivism trended significantly (p =08), while individualism still showed no significance. In other words, higher degree of collectivism was predictive of lesser behavioral opposition given the prospect of having to take senior examinations before graduation (i.e., high vested interest).

46. Nutrition, Health, and Existence on Malaga  
*University of Southern Maine*  
**AUTHORS:** Alexandria S. King, Nathan Hamilton, Robert Sanford  
**FACULTY MENTOR:** Rebecca Nisetich  

**ABSTRACT:**  
Malaga Island lies just off the coast of Phippsburg, Maine and was home to a mixed-race fishing community between 1860 and 1912. Among one of the last foraging cultures, these islanders made a living by exploiting the land and sea around them. This included hunting, trapping, fishing, gardening, and a few purchases from a mainland store. Due primarily to prejudice and the development of the tourism industry in Maine, these people were evicted from the island that they had called their home for five decades. A rare and very exciting aspect of this project is that we’re able to connect each excavation site with a specific individual, whose names and faces we know. This enables us to reconstruct their way of life, and understand the role each person played in the community. Ultimately, this project focuses on the nutrition and health of the islanders, based off of recovered faunal remains. This provides an even deeper understanding of the way the islanders lived.
47. Amplification and Analysis of Genes Encoding Encapsulin Nano-Compartments in Acidophilic and Alkaliphilic Bacteria

*University of Southern Maine*

**AUTHORS:** Jillian M. King, Naun Lobo, Karen Moulton, L. J. Rothschild

**FACULTY MENTOR:** S. M. Duboise

**ABSTRACT:**
Microbial intracellular nano-compartments sequester enzymes to protect and regulate their activity and are important in evolutionary biology, astrobiology, and nanobiotechnology. Encapsulin proteins self-assemble into intracellular compartments that can contain peroxidases or ferritin-like proteins involved in oxidative stress responses. Encapsulins, novel protein structures just 20-24 nm in diameter with an internal cavity of up to 20 nm, are the smallest microbial nano-compartments yet discovered. These compartments are strikingly similar in structure to some well studied viral capsids such as in the coliphage HK-97. In this project, extremophile virology collaborations of the USM Virology and Electron Microscopy Lab group at USM with Dr. Lynn Rothschild’s astrobiology research group at NASA Ames Research Center are extended to the study of these protein nano-compartments that are expected to be present in many of the microbes previously isolated from diverse environmental settings. Degenerate oligonucleotide primers have been designed based upon known encapsulin protein sequences in genomics databases. Polymerase chain reaction amplification of encapsulin gene sequences from acidophilic and alkaliphilic microbes is proceeding and will be followed, it is hoped, by protein expression and assembly of selected encapsulins. These nano-compartments will be further explored for potential nanobiotechnology applications, building upon the bacteriophage capsid nanoparticle design work of Dr. Naun Lobo at USM.

48. Genes, Express Yourself

*Southern Maine Community College*

**AUTHOR:** Emily J. Krusec

**FACULTY MENTOR:** Elizabeth Ehrenfeld

**ABSTRACT:**
Attention Deficit Hyperactivity Disorder (ADHD) has been diagnosed in 5.29% of children globally making it the most common psychiatric disorder to date. This literature review will examine lead as an environmental risk factor that can alter how genes are expressed. This can be done through epigenetic changes which alter the expression of genes but not the genes sequence. This can ultimately lead to the development of ADHD. It was shown in a survey, conducted from 2001-2004, that lead exposure was determined to have epigenetic effects which caused ADHD. Through finding and understanding the epigenetic processes involved in associating lead to an elevated risk for ADHD may provide possibilities for prevention.

15. Individual Perceptions of Consent in Sexual Activities

*University of Southern Maine*

**AUTHOR:** Matthew Langella

**FACULTY MENTOR:** Charles Smith

**ABSTRACT:**
Sexual consent is a complex issue that on the surface appears to be easily understood but in reality is comprised of many nuanced issues. There is extensive research that has focused on coercion and rape. The focus of this research project is to explore how sexual consent is perceived and understood by those in different demographic groups. Research consistently finds that sexual communication is often composed more of nonverbal behavioral cues than verbal discussions. Our hypothesis that different demographic groups will interpret sexual consent differently is supported by social scripting theory which claims that men and women have developed internalized scripts based upon socially constructed norms of behavior. These internalized scripts often influence gender specific misrepresentations of sexual interest or consent. An additional goal of this project is to examine whether this research is generalizable to other demographic groups. The study itself is an on-line cross sectional self-administered survey distributed via snowball sampling. Research questions include: How will gender affect perceptions of consent? How will age affect perceptions of consent? How will one’s relationship status affect perceptions of consent? How
will educational attainment affect perceptions of consent? How will the impact of sexual assault affect perceptions of consent? How does adherence to traditional gender roles affect perceptions of consent?

49. Monitoring Habitat Fragmentation in the Sebago Lake Watershed Using NASA’s Landsat 8 Data

*University of Southern Maine*

**AUTHOR:** Jared J. Lank  
**FACULTY MENTOR:** Firooza Pavri

**ABSTRACT:**
This research utilizes NASA’s latest Landsat data to compare and contrast the amount and extent of urban development occurring within the Sebago lake watershed. The research uses a pixel re-classification method of Landsat’s multiband imagery of the area to create raster images containing data on the types of land cover within the watershed. The reclassified images were analyzed and broken down into numerical statistics and recorded for comparison to prior land use classification studies on the watershed. Visual and statistical comparisons of prior research results with the newest research were conducted to establish a rate and type of change occurring over time within the watershed. The Habitat Priority Planner tool was used to assess the watershed and its subwatersheds for level of risk associated with development as well. An online open access map containing all land use data and statistics was also created for Portland Water District in order for the data to be more easily accessible to both PWD and the public.

50. Affordable Smart Home Automation using LabVIEW

*University of Southern Maine*

**AUTHORS:** Pier-Michel Lapointe, Evan Browne  
**FACULTY MENTOR:** Mehrdaad Ghorashi, Andres Torres, Mao Ye

**ABSTRACT:**
The need for improvement in home efficiency is undeniable. The objective of this project is to design and implement a home automation system that runs on LabVIEW and can be controlled remotely. The primary aims are improving energy efficiency, simplicity, cost cutting, and expandability. In this project, microcontrollers, motors, LEDs, temperature sensors, and motion sensors are used and the controls are provided by LabVIEW. To demonstrate the essential functionalities of home automation, a scaled model of a house has been manufactured. Circuits have been built to control the motors speed, which will be used for fans, as well as for controlling the LED lights. Further sensors, such as photo sensors and motion sensors will be used to implement different uses for home automation. This home automation system can be expanded to include additional functionalities. It also enables non-engineer hobbyists with no programming background to design, customize, implement, and troubleshoot some of the most widely used home automation features.

51. Comparing the Effect of Ketogenic Diets on Seizure Frequency in Children and Young Adults: A Systematic Literature Review

*University of Southern Maine*

**AUTHORS:** Jennifer Lehto, Donna L. Piccininni  
**FACULTY MENTOR:** Carol Fackler

**ABSTRACT:**
For almost a century the classic ketogenic diet (KD) has been used as a dietary therapy to reduce seizure frequency in patients with epilepsy. Recently several variants of the diet have been developed to improve palatability and dietary adherence. The purpose of this systematic literature review is to review and report on the current evidence, comparing the efficacy of the newer diets to the KD on reducing seizure frequency in children and young adults. The search strategy utilized the Cumulative Index to Nursing and Allied Health and Medline electronic databases. Keywords included: "ketogenic diet," "low glycemic index diet," "modified Atkins diet," and "medium-chain triglyceride ketogenic diet;" and cross-referenced with "epilepsy" or "epilepsies." Studies were included if the study participants were between the ages of 0 and 22 years with epilepsy, and if they contained information on classic, modified Atkins (MAD), medium-chain triglyceride (MCT), and/or low glycemic index ketogenic (LGIT) diets. Eight studies qualified for inclusion in the final sample. Preliminary
findings indicate that, compared to MAD, MCT, and LGIT, KD is associated with fewer incidents of seizure activity. Based on the findings the authors will be presenting implications for practice, education, and future research, which may include recommendations related to diet therapy and health provider and consumer education.

52. Computational Identification and Biological Validation of FOXJ1 Regulatory Regions in Strongylocentrotus Purpuratus
University of Southern Maine

AUTHORS: Craig R. Lessard, James A. Coffman, Christopher M. McCarty, Samuel McFarland, Jeffrey A. Thompson
FACULTY MENTOR: Clare Bates Congdon

ABSTRACT:
In this work, we used computational methods to identify candidate regulatory regions in proximity to the FOXJ1 gene. We then investigated these candidates in the sea urchin Strongylocentrotus purpuratus using a DNA-tag reporter system. We found that 5/9 candidate regions were biologically active at the time points measured. S. purpuratus is a model species for studying embryonic cilia development, and the study of S. purpuratus may lead to advances in treatment for cilia-related diseases in humans. The FOXJ1 gene is a member of the forkhead family of transcription factors, and presumably functions as a master regulator of ciliary genes. Our goal is to computationally identify candidate regulatory elements for the FOXJ1 gene and investigate the expression of these elements at 14, 16, and 18 hours post-fertilization, the period when cilia first form. We used GAMI (Genetic Algorithms for Motif Inference) to identify candidate regulatory regions in silico. GAMI evolves hundreds of candidate functional elements, which are formed into candidate CRMs using the complement tool GAMI-CRM. Here, we generated a listing of 12 candidate CRMs for the noncoding regions surrounding the FOXJ1 gene in S. purpuratus, which were then investigated in vivo. Of the 12 candidate CRMs, 9/12 were successfully amplified and ligated to reporter constructs, then microinjected into egg cytoplasm directly following fertilization. This assay revealed that 5/9 candidate CRMs were biologically active in all three time points.

53. The Effects of 3 Different Calisthenic Squat (Tabata) Routines on the Characteristics of Excess Post-Exercise Oxygen Consumption (EPOC)
University of Southern Maine

AUTHORS: Brian D. Ligotti, Jonathan R. Paradis
FACULTY MENTOR: Chris B. Scott

ABSTRACT:
Excess post-exercise oxygen consumption (EPOC) is often times an unrepresented part of the energy cost of exercise. EPOC is the elevated oxygen consumption measured immediately after exercise stops, until oxygen consumption reaches pre-exercise levels. While it is well known that exercise intensity affects the energy costs of recovery, there is little research that exists on the differences between movement type and post exercise energy costs. For this project we will be using 3 types of calisthenic squat routines: isometric, isotonic and ballistic to test the effect of movement type on EPOC.

54. An Outdoor Classroom to Improve the Student Experience and Connecting to the Community
University of Southern Maine

AUTHOR: Chelsea Malacara
FACULTY MENTOR: Robert Sanford

ABSTRACT:
Giving students an opportunity to learn outdoors unites them to their surroundings and closes the gap between human and nature. Outdoor spaces contribute to ecological literacy and are critical to a well-rounded education. The University of Southern Maine community places emphasis on environmental stewardship through classroom instruction and campus projects. The Gorham campus has 9 acres of wooded area plus unused green space. I am proposing the construction of an outdoor
classroom. The proposal will include interviews from various stakeholders, a budget for materials and construction, and a site assessment for two potential sites—one in the 9 acre wooded area and one in the existing apple orchard. A diagram and 3D model of the outdoor classroom will be created for the proposed site per the Site Planning and Design Handbook (Russ, 2012) and to the "design with nature" ideals of Ian McHarg. An outdoor classroom on the Gorham campus would enhance the learning experience, student connection to the community, and add to overall campus landscape and flow.

55. Comparing The Energy Cost of Three Different Calisthenic Squatting Routines

*University of Southern Maine*

**AUTHORS:** Sarah Martin, Fiona Densmore, Kelly LaCroix  
**FACULTY MENTOR:** Christopher Scott

**ABSTRACT:**
The purpose of this study is to determine the total energy expenditure of three different callisthenic squatting routines: an isometric squat, a jump squat, and an isotonic squat. Subjects visited the Human Performance Lab at the University of Southern Maine a total of 7 times on 7 separate occasions. Each participant was randomly assigned to 20-seconds of a specific squat routine paired with 10-second rest periods for 8 consecutive sets. Five minutes prior to exercise, as well as during exercise and recovery, subjects were hooked up to a metabolic cart that measured oxygen consumption. Blood lactate was measured twice before exercise and during the recovery stage using a micro-lancet pricking the finger and collecting blood droplets with two blood lactate test meters. The subject's oxygen consumption before, during, and after exercise allowed us to measure aerobic energy costs while the blood lactate measurements before and during recovery allowed us to calculate anaerobic energy costs. Overall, we hypothesize that the jump squat protocol will yield the highest total energy expenditure (kilocalories).

56. Perceptions of Professionals within Interdisciplinary Teams

*University of Southern Maine*

**AUTHORS:** Melanie Mauro, Jessica Platanitis  
**FACULTY MENTOR:** Charles Smith

**ABSTRACT:**
There has been a recent movement toward professionals working more closely in interdisciplinary teams within healthcare settings. Yet, literature has shown there is a definite lack of understanding of other professionals’ roles, creating friction and lack of respect between professionals. While the movement toward more multidisciplinary teamwork can create positive outcomes and fill gaps in services for patients, it is imperative that professionals recognize and value each other’s roles to limit negative outcomes such as lower employee morale, less effective team work and poorer patient outcomes. The information gathered for this study will hopefully increase awareness of the positive and negative perceptions within an interdisciplinary team and would be beneficial to support efforts toward more cohesive and collaborate teams within the organization and across the health care system. The study itself is an on-line cross sectional self-administered survey distributed through a variety of sources, including Maine Medical Center. Research questions include but are not limited to: 1) Descriptively, what is the nature of perceptions of other professionals in a healthcare setting that widely utilizes interdisciplinary teams; and 2) What factors are predictive of differing levels of understanding and support for professionals in other disciplines.

57. An Interdisciplinary Approach to Improve Weight Loss in Low-Income Overweight and Obese Women

*University of Southern Maine*

**AUTHOR:** Melissa M. Messer  
**FACULTY MENTOR:** Carol Fackler

**ABSTRACT:**
Obesity has risen to epidemic levels in the U.S and has been labeled a national health threat and a significant public health challenge.
In the U.S, lower income levels are associated with higher rates of obesity, particularly among women. The ability to manage obesity requires access to ample resources that promote good nutrition and physical activity. Low-income women are disproportionately at risk for obesity and its negative health consequences due to insufficient resources. Collaborating with various professionals from the public health sector who work with low-income overweight and obese women, healthcare providers can tailor weight-loss interventions to the specific needs of this population, incorporating knowledge of both barriers and facilitators to weight loss interventions for this population. An interprofessional approach that promotes weight-loss in low-income overweight and obese women would involve obesity researchers, healthcare providers, public health officials, and health policy-makers. This approach might include education about healthy lifestyle practices, development and implementation of weight-loss interventions, and construction of new overweight and obesity policies. Appropriate outcome measures must be identified to evaluate the efficacy of the interprofessional approach, taking into account the barriers created by the lack of available resources in this population of women.

58. Human Anatomy Studio Art Project  
*Southern Maine Community College*  
**AUTHOR:** Nelea Mihaila  
**FACULTY MENTOR:** Charles Ott  
**ABSTRACT:**  
This art project is focused on exploring human anatomy by means of drawing from sculpture and life models. The drawing process incorporates photo references taken at local museums and online resources. Attending life drawing classes and studio sessions allows for a thorough exploration of the gestural qualities found in the life model. Drawing from sculptures helps understand different artists and their approaches of describing human anatomy. The drawing media include compressed and willow charcoal, Conte, and pastels. Different types of paper are used depending on the objectives of each drawing. The work in progress is evaluated by professor Ott who provides advising and critique and by students involved in similar art projects. The purpose of this art project is to develop aesthetic sensibility and personal growth.

59. Maine’s Breastfeeding Gap: How Initiation and Duration Differ by Socioeconomic Status  
*University of Southern Maine*  
**AUTHOR:** Zoe S. Miller  
**FACULTY MENTOR:** Brenda Joly  
**ABSTRACT:**  
The health benefits of breastfeeding for both mothers and children are widely recognized. The American Academy of Pediatrics and the World Health Organization both recommend exclusive breastfeeding for six months. Maine’s overall breastfeeding rates suggest progress toward this goal with almost three out of four Maine mothers initiating breastfeeding and two in five mothers still breastfeeding at six months. When differences in socioeconomic status are considered however, clear disparities emerge. Data collected in Maine for the Pregnancy Risk Assessment Monitoring System (PRAMS) from 2011 was used to assess differences in breastfeeding across income and education. In general, breastfeeding initiation and duration rates increase as income and education levels increase. The lowest socioeconomic status (SES) mothers’ initiation rates are only 10 to 15 percentage points lower than the highest SES mothers. However, at 3-6 months, the lowest SES mothers’ breastfeeding rates are more than 40 percentage points lower than those of highest SES mothers. Lower initiation and duration rates among mothers of low socioeconomic status versus their high socioeconomic status peers suggests a role for environmental and social factors.

60. Agricultural Flame Weeder  
*University of Southern Maine*  
**AUTHORS:** Michael Moon, Abdelaziz Rhazzali, Mark Davis, and Brent Muehle  
**FACULTY MENTOR:** Mehrdaad Ghorashi
**ABSTRACT:**
Small-scale organic agriculturalists use propane flame weeders to kill unwanted plants and insects during different stages of the growing season. The intent of this design project is to modify the current tool to provide a more localized, less intense flame that can eliminate small weeds amongst desirable crops. Improving adaptability and work efficiency are the main objectives of this design activity. Computational analysis is applied to model the effectiveness of the re-designed elements. The results of this study can be used for future developments and larger scaled applications.

61. The Relationship Between Vegetarianism and Heart Disease: A Systematic Literature Review
*University of Southern Maine*

**AUTHORS:** Jared Morin, Melissa Bicknell

**FACULTY MENTOR:** Carol Fackler

**ABSTRACT:**
Reports of high mortality related to heart disease has resulted in an increase in research examining the relationship between consuming a vegetarian diet and the risk of heart disease. Vegetarian diets have been shown to decrease LDL cholesterol and increase dietary intake of polyunsaturated fatty acids, thereby leading to positive outcomes. The purpose of this systematic literature review is to review and report on the current evidence about the relationship between eating a vegetarian diet and heart disease risk. The search strategy utilized the MEDLINE and PubMed databases. Keywords used: vegetarian, diet, heart disease, coronary disease, vegan, and lifestyle. Studies were included if they were conducted in the last 20 years and had a statistically significant sample size. A final sample of eight studies were used for the review. Preliminary findings indicate that there is a relationship between a vegetarian diet and reduction in heart disease risk. In the eight studies reviewed, seven found strong negative statistically significant correlations between eating a vegetarian diet and the development of coronary artery disease, while findings in one study was not statistically significant. Based on the findings the authors will be presenting implications for practice, education, future research and policy. These may include recommendations related to diet, health provider and consumer education, and directions for future research in this clinical topic area.

62. Differences in Caloric Cost Through Calisthenic Squat Routine Across Genders
*University of Southern Maine*

**AUTHORS:** Eryn Nelson, Breanna Beauchesne, Kathryn Fox, Chelsea Freeman

**FACULTY MENTOR:** Christopher Scott

**ABSTRACT:**
Time is often listed as one of the main barriers for exercise. As a result time-saving exercise strategies, like those provided by Tabata training (8 sets consisting of 20 seconds work followed by 10 seconds of rest) have become increasingly popular as a preferred mode of exercise. The purpose of this study was to determine if a variety of calisthenic interval squat routines using a Tabata protocol would elicit different caloric costs in men versus women. Using a metabolic cart, we measured oxygen consumption during a five minute standing rest and during exercise. Post exercise measurements continued until two consecutive VO2 measurements below 5.0 ml/kg/min were recorded. This information was used to estimate aerobic energy expenditure. Anaerobic energy expenditure was estimated using blood lactate measurements at rest and at two and a half minutes post exercise. The squat protocol consisted of performing three different exercises: isometric squat, isotonic squat, and jump squat. Each of these tests were performed twice to decrease error in testing procedures.

63. Chronic Low Back Pain
*University of Southern Maine*

**AUTHORS:** Adrianna R. Newton, Samantha M. Dobson

**FACULTY MENTOR:** James Schilling
ABSTRACT:
The purpose of this project was to construct a treatment protocol using therapeutic exercise carried out to diminish or reduce chronic low back pain. This protocol is for all patients whose pain persists for 12 weeks or more, with non-specific low back pain that is not attributed to a recognizable pathology. The sources of the literature search included the following databases: EBSCO and USM library. Over 70% of people in developed countries suffer with low back pain at some point in their lives, but recovery is not always favorable. Around 82% of patients will still experience pain one year later and spend months if not years seeking relief. Based on the lack of literature on this protocol, initiated the urgency of this rehabilitation plan. Functional exercises involving neuromuscular control should be initiated first, to improve reflexes and balance. These types of exercises encourage patients to focus on joint positioning and movement simultaneously. Next, functional exercises involving strength are performed. Strengthening the surrounding muscles, for patients with chronic low back pain, are required to counteract muscle atrophy damage, and to improve stability. Functional exercises in this protocol progression include: proprioceptive neuromuscular facilitation (PNF), ball exercises, balancing exercises, McKenzie Method, yoga, and dynamic stretching. In conclusion, this research provides valuable information for clinicians conducting orthopedic care for chronic low back pain sustained by any population.

64. Efficient Filter Design for FPGA Implementation

_University of Southern Maine_

**AUTHOR:** Andrew Norster

**FACULTY MENTOR:** Mariusz Jankowski

**ABSTRACT:**
This project focuses on design of Finite Impulse Response (FIR) filters for Field Programmable Gate Array (FPGA) implementation and comparison of various implementation methods. FPGAs offer highly parallel platforms in increasingly flexible packages. The dollar-per-gate ratio has continued to decline while devices packages have grown to incorporate multi-core processors. This has made them competitive targets for many designs which would have previously required separate FPGA/CPU components or customized ASICs. In this project, a high efficiency filtering prototype has been designed and implemented on a latest generation FPGA- the Xilinx Zynq 7020. This work would be relevant applications in image processing and communications.

65. Genotoxicity of Acrolein and Arsenic Co-exposure in Human Lung Cells

_University of Southern Maine_

**AUTHORS:** Nicole E. Nutter, Shou-Ping Huang, John Wise Sr., Hong Xie

**FACULTY MENTOR:** Hong Xie

**ABSTRACT:**
Acrolein is released into the environment from the burning of organic matter such as tobacco, gasoline, oil or wood. Arsenic occurs naturally in the environment or from industrial sources. People can be exposed to these chemicals by eating food, drinking water, and inhaling air. Acrolein and arsenic are both known human carcinogens. However, there is little research information on the possible carcinogenicity of acrolein and arsenic co-exposure, although people are exposed to these chemicals concurrently under most conditions. Previous research on the co-treatment of arsenic with other known carcinogens found an increase in carcinogenic activity. Therefore, the purpose of this study is to determine the carcinogenicity of acrolein and arsenic co-exposure in human lung cells. One known effect of carcinogenic substance induced is genotoxicity, including chromosome damage and DNA strand breaks. In order to investigate the toxic effects of acrolein and arsenic co-exposure, we analyzed cell death and chromosomal damage in human lung cells. The formation of DNA double strand breaks in the form of \( \gamma \)-H2AX foci were measured. This work is supported by NIEHS grants R15ES021587 (H.X.) and ES016893 (J.P.W.) and NASA Maine Space Grant Consortium.

66. Geospatial Hacking

_University of Southern Maine_

**AUTHOR:** Sam Overlock

**FACULTY MENTOR:** Glenn Wilson
ABSTRACT:
The purpose of this study is to correlate cyber security and geospatial technologies. Communication, navigation, and surveillance systems are critical in making many parts of life and business more efficient or enjoyable. These systems can be as complicated as a ship navigation system or as common as a cellular phone. If technology or an information source is vulnerable on a cyber security level, then it can translate to a vulnerability in an actual geographic location. Leveraging geospatial data sources and geographic information systems (GIS) allows people to visualize the data in real world locations. Therefore, the examples, visualizations, and maps produced from these sources will reinforce the importance of technology and information security. The anticipated outcome of this project is to show that GIS and geospatial information can be used as a powerful tool to bridge the gap between cyber security and geographic location.

67. Security Onion Research and Operation
University of Southern Maine
AUTHOR: Kyle Perreault
FACULTY MENTOR: Glenn Wilson

ABSTRACT:
Time and again the castle walls of cyber security have been breached, Target, Anthem to name but a few, this raises the question; how do you know when the barbarians have breached the gate? Security Onion is an intrusion detection system that is crucial to our puzzle that we and others use for monitoring; however, it suffers from being very complex as do all intrusion detection systems (IDS). The purpose of this research is to provide a beneficial, cheap, and easy to use, IDS for small businesses. The core principles of Security Onion are: Live intrusion monitoring, Sql stored database, Centrally stored logs for easy queries, Multiple IDS software, Live alerts. These principles will be presented along with several practical applications such as: BRO, ELSA, Email Alerts, Wireshark, along with our efforts to simplify their use.

68. The Great Idea: Embracing the Mysterious Nature of Creativity
Southern Maine Community College
AUTHOR: Ivan Pickett
FACULTY MENTOR: Charles Ott

ABSTRACT:
Southern Maine Community College offers independent study credits for gifted creators. This allows students to design their own curriculum and express their own artistic voice. The impact of comics and graphic novels is often overlooked in compiled lists of important literary works. The Great Idea webcomic series will be freely available online and strives to inspire every reader to find the greatness within themselves. In a 2008 lecture, author Elizabeth Gilbert explains that in the ancient world, creativity was not attributed to the artist, but to a supernatural being called a Genius. Giving our world a twist of magical realism, The Great Idea follows Thomas, a goldfish salesman, the only human on Earth capable of interacting with his own Genius. This elusive creature, named Elodie, reminds Thomas of details of his own abnormally long life. Throughout this surrealist fairy tale, Thomas is able to slowly unpiece his identity as he learns more about the hidden world of the Geniuses. The project is evaluated by professor Chuck Ott and students involved in similar independent art projects. This graphic novel is composed on a drawing tablet in order to provide a cleaner appearance on high resolution displays. The objectives of this project include personal improvement in the field of digital media and to encourage readers to embrace their own imaginations.

69. The Influence of Infant Feeding Method on Symptom Severity and Outcomes of Neonatal Abstinence Syndrome: A Systematic Literature Review
University of Southern Maine
AUTHORS: Kristen K. Poliquin Tifft, Brittany Ames
FACULTY MENTOR: Carol Fackler
ABSTRACT:
The rate of infants born drug addicted has increased significantly within the past decade. Understanding neonatal abstinence syndrome (NAS) and factors that influence positive infant outcomes can help reduce morbidity and mortality, family strain, and the burdening of health care utilization and social service resources. One factor associated with positive infant outcomes is the consumption of the mother’s breast milk versus formula. A systematic review of current research was conducted to examine how newborn feeding method influences the symptom severity and outcomes of infants born with NAS. Twenty-two quantitative research studies published between 2007 and 2015 were collected by performing searches of MEDLINE and CINAHL databases, as well as by manual extraction of relevant research articles’ reference lists. Keywords included breast feeding, NAS, feeding method, antenatal, methadone, drug use, pregnancy, opiate dependence, mother’s milk, and outcome. The final sample of eight studies met the inclusion criteria of being current research, published in English that examined the effects of feeding method on infants hospitalized with NAS. Preliminary findings indicate the consumption of the mother’s breast milk decreases the severity of NAS symptoms and increases positive infant outcomes. Based on the findings, the authors will be presenting implications for nursing practice, policy, education, and future research.

70. Lead Content of Playground Soil in Portland, Maine

University of Southern Maine

AUTHORS: Megan Pryor, Kirsten Fryling, Sarah Huber

FACULTY MENTOR: Joseph Staples

ABSTRACT:
Children exposed to lead are at serious risk for lasting cognitive and behavioral impairment. Urban soil typically exhibits greater concentrations of lead than soil in rural areas, in part due to the lasting impacts of contamination from past industry as well as the use of leaded gasoline and crowded housing conditions leading to an increased potential for lead contamination from flaking lead-based paint from older housing stock. Some Portland, Maine playgrounds have been built in close proximity to delead homes and near old industrial sites. According to the Centers for Disease Control (CDC), lead does not dissipate, biodegrade, or decay, and can be absorbed into the soil. The U.S. Environmental Protection Agency (EPA) and the Maine Department of Environmental Protection (DEP) have established acceptable soil lead levels, although there is no known safe level for lead. The EPA has set the acceptable level of lead in playground soils at 400 ppm. The Maine DEP has set the remedial action level at 375 ppm. According to the Maine Remedial Action Guidelines (RAGs), the remedial action level of lead in undeveloped soil is 32ppm. In Portland, lead is of particular concern as past studies have shown evidence of lead contamination in some areas. Given the industrial history and population density of Portland, Maine, playgrounds may be at risk for lead contamination. The purpose of our research was to test soil samples from Portland playgrounds to determine if lead content posed a health risk to children.

71. Music Interventions Can Improve Cognition In Dementia

University of Southern Maine

AUTHORS: Carly Ramos, Nadine Lanham

FACULTY MENTOR: Carol Fackler

ABSTRACT:
Dementia affects 35.6 million people worldwide. Music-based interventions may be an economical, non-pharmacological supplement to traditional treatment, in improving cognitive functioning in this population. The purpose of this systematic review of the literature was to examine the current literature exploring the effect of music-based interventions on cognitive functioning in adults with dementia. The search strategy included the databases PubMed, Medline, PsychINFO and CINAHL. Search terms included dementia, cognition, music, cognitive functioning, short term memory, attention, language, verbal skills, music therapy, elderly, and non-pharmacological intervention. A final sample of nine qualitative intervention studies was selected for review. Preliminary findings indicate that music interventions in the form of singing, music listening, and playing instruments improves executive functioning, memory, orientation, and attention in individuals with cognitive impairment. Based on the findings the authors will present implications for practice, education, future research, and policy. These may include recommendations related to interventions for clients with dementia, education for caregivers of clients with dementia regarding music therapy, and future research related to implementation of music interventions for cognitive functioning.
72. PCI DSS 3.0 meets Security

University of Southern Maine

AUTHOR: Kimberly Reali
FACULTY MENTOR: Troy Jordan

ABSTRACT:
We have all heard about the credit card breaches that have plagued the US (e.g. Target, Hannaford, Neiman Marcus). In October 2013, the PCI DSS Council released a major update that on January 1, 2015 became mandatory for all merchants that accept process and/or transmit credit card payments. However, many small merchants struggle with confusion and technical difficulties that surround these requirements. We have performed extensive research into the requirements for PCI compliance. We have completed several interviews with PCI ASV/QSA companies, a Secret Service Agent, the University of Maine’s Network Systems Security Analyst, a PCI Compliance officer for Wendy’s Corp, a Maine Cyber Security Cluster Board Member, acquiring banks, and our client’s POS vendors. The goal of this project is to devise a logical model for small businesses: to locate affordable resources; to decrease the credit card data environment in scope for PCI compliance; to help achieve and maintain PCI compliance; and to recommend Security techniques based on ISO 27001/27002 Standards that will help close the gap between PCI compliance and overall information security.

73. Dementia Caregivers: Perceptions and Use of Supports

University of Southern Maine

AUTHORS: Susan A. Salomon, Patrick F. Clancy
FACULTY MENTOR: Charles A. Smith

ABSTRACT:
Prior literature has identified a lack of access to and awareness of dementia/Alzheimer’s disease-related support (respite/daycare centers, area agencies on aging, Alzheimer’s Association, support groups, etc.) to persons living with dementia and their caregivers. For dementia caregivers overburdened with caregiving tasks, or for persons living with dementia unable to access resources for themselves (self-neglect), understanding why people - both dementia caregivers and the general public - have little knowledge of eldercare resources, and illustrating people’s perceptions of what resources are out in the community is essential to ethical eldercare practice. Our project seeks to ask dementia caregivers (or any individual w/ a connection to dementia caregiving) and identify their perceptions of what dementia/ALZ related resources are out in the community. Our hope is to ascertain the perceptions of both dementia caregivers in one group, and the perceptions of the general public in another, and compare the two. The study itself is an on-line cross sectional self-administered survey distributed through a variety of sources, including the Alzheimers Association of Maine. Research questions will include, but are not limited to: 1) nature of services and supports utilized by caregivers of individuals with dementia; 2) barriers to utilization of services and supports for families dealing with dementia, and 3) examination of what factors are predictive of usage of services and supports.

74. A system for analog filter design, realization and verification using Mathematica and SystemModeler

University of Southern Maine

AUTHOR: Tatjana Samardzic
FACULTY MENTOR: Mariusz Jankowski

ABSTRACT:
Analog filters are an essential part of modern electronics; however, their design, realization and verification can be arduous and time consuming. This poster describes a Mathematica and SystemModeler platform for automated, fast analog filter design and simulation. The platform consists of two key components: I. SystemModeler library of first and second order low-pass, high-pass, band-pass, band-stop, and all-pass filters. The models were created based on some of the most popular filter topologies: Sallen-Key, Tow-Thomas, State Variable, Multiple Feedback, Bainter and Boctor circuits. They serve as basic building blocks in creation of higher order filters. II. Mathematica package based on Butterworth, Chebyshev, inverse Chebyshev and elliptic frequency response approximations and different filter topologies. For a given set of design specifications such as filter type, frequency range, attenuation and gain, the program returns the filter...
order, number of first and second-order filter stages to be cascaded, and transfer function, gain, cutoff frequency and quality factor for each stage. For any user-selected filter topology, the program returns values of filter components (resistors and capacitors) for each stage, creates a circuit model, applies the component values to the model and simulates the model to verify the time and frequency responses of the circuit. We therefore, have a fast and effective means of filter realization and verification, with programmatic control of simulation and filter components.

75. Day to Day Exemplars vs Aspirational Role Models

*University of Southern Maine*

**AUTHORS:** Kristel L. Samson, Claire Bee, Cara Coro, Karre Kern, Heather Pollard, Anne Tobias

**FACULTY MENTOR:** Charles Smith

**ABSTRACT:**
There is a wide body of literature, as well as social programs, that examine the influence of role models on at-risk individuals. Considerable resources, including both time and money, are invested by public organizations (e.g., schools) in fostering and developing aspirational role models for individuals that are deemed “at risk”. At the same time there is a wide body of research that suggests that humans largely conform (often unconsciously) to the world and individuals immediately around themselves, with a particular inclination to conform to individuals who are perceived to be part of a person’s peer group (Harris, 2010). This study seeks to examine the intersection between these two different schools of thought on the influence of external influences on behaviors. Are aspiration role models or day-to-day peer role models more influential in determining the outcomes of people’s behaviors? Knowledge of this nature can be used to inform interventions to assist at-risk populations, by targeting constrained resources in the most effective manner. The study itself is an on-line cross sectional self-administered survey distributed through a variety of sources, including the Cancer Community Center. Questions seek to capture the influence of different types of “role models” and sources of information on a range of behaviors.

76. Connecting With Our Inner Neanderthal

*Southern Maine Community College*

**AUTHOR:** Guy T. Seavey

**FACULTY MENTOR:** Elizabeth E. Ehrenfeld

**ABSTRACT:**
There are still many secrets to our evolution as a species. Gaps in the fossil record and questions unanswered create many hypotheses regarding where modern-day humans come from. Some of those secrets are being revealed in light of the completed genome of the race of hominids known as Neanderthals. As chromosomal DNA is replicated the base pairs are match with near perfection. There is a single nucleotide difference between humans at approximately every 1200 to 1300 base pairs resulting in approximately 3 million differences that identify many things; including our ancestry. About 2.5% of today’s Northern European Homo sapiens’ chromosomal DNA and 4% in those of Asian descent directly links us to Neanderthals. The genome sequence of the Neanderthal samples indicate that there was interbreeding as the migrating Homo genus left Africa and began populating Europe and Asia. The lack of Neanderthal DNA present in African hominids provides the control. This is a literature review examining evidence of the presence of Neanderthal DNA in contemporary Homo sapiens with European and Asian heritage.

77. An Investigation to Remotely Sense Mineral Leeching Through Soils

*University of Southern Maine*

**AUTHOR:** Paul Shaffer C. Shaffer

**FACULTY MENTOR:** Firooza Pavri

**ABSTRACT:**
Satellite data of the Earth’s surface provide a wealth of information on landscape conditions. I use Landsat data to determine an important
geologic process that influences the composition of the soils. My project focuses on the experimental hypothesis that we can use plant vigor as a proxy to document mineral washing downslopes through soils. I constructed a Normalized Difference Vegetation Index (NDVI) composite image from Landsat data to help assess vegetation heath in my target location - a national park south of Mount St. Helens. This location was selected because of its steep inclines, dense undisturbed vegetation, and fertile soils. It is my hypothesis that as water trickles down through the soil it picks up and moves the dissolvable minerals downslope, therefore providing more minerals that aid vegetation growth and vigor at the bottom of the slopes. The NDVI analysis presented here provides data that can be used in a more detailed analysis of the same.

78. A Case for Reviving Historical Passenger Rail Connections in Maine

*University of Southern Maine*

**AUTHOR:** Cecilia B. Smith  
**FACULTY MENTOR:** Elizabeth Bischof

**ABSTRACT:**  
For many years, economic development plans for the state of Maine have emphasized the growing potential of nature-based tourism, especially in distressed rural areas of the state. While Southern and coastal Maine struggle to absorb and manage rapid growth, scattered communities within the state’s vast interior are experiencing loss of both people and jobs. In the nineteenth-century, railroad companies played a vital role in the creation of a nature-based tourism economy in the state. This study, based on Maine’s long history of nature tourism, compares the state’s historic railroad system with current transportation needs using a Geographic Information System (GIS) as a visualization and analysis tool. Historic sites that provide strong potential for re-installing passenger train services were identified.

79. Burnout Among Social Workers

*University of Southern Maine*

**AUTHORS:** Cara m. Snyder, Elizabeth Naber, Jess Welch  
**FACULTY MENTOR:** Charles Smith

**ABSTRACT:**  
A common complaint among social worker is “burnout”. The aim of this study is to attempt to replicate a prior study among social workers in Israel conducted by Hamama (2012). The prior study found that when extrinsic work conditions (privacy, relaxed atmosphere in the room, accessibility to a phone and noise) and intrinsic work conditions (ability to succeed in interventions, extent of challenge, interest, self-fulfillment, meaning and logic at work) were present, rates of burnout were lower. Younger social workers, under age 30, were more likely to experience burnout when their intrinsic work conditions were lower (e.g., low sense of meaning, low autonomy). Whereas older social workers have less burnout because they are more resilient, less preoccupied with work as a result of strong connections to family that enhances their sense of strength and security. Lastly, it was found that workplace social support significantly contributes to reducing burnout among human service professionals, especially from colleagues and agency heads. Colleagues provide emotional and informative support, technical assistance as well as a sense of partnership. Agency heads provide practical, instrumental assistance (set priorities, make decisions about tasks, and allocate resources), which benefit extrinsic and intrinsic work conditions. The study itself is an on-line cross sectional self-administered survey distributed via snowball sampling to try and identify social workers in Maine.

80. Solar Thermal Syphon Water Heater

*University of Southern Maine*

**AUTHORS:** Ashley Soucy, Tru Nguyen  
**FACULTY MENTOR:** James Masi

**ABSTRACT:**  
The easiest and most practical application of solar energy is for heating water. It has been technically feasible to heat household water
using solar energy since the 1930s. Solar water heaters for homes and industry have been employed extensively in Israel, Australia, and Japan, and were quite popular in Florida and California prior to World War II. A solar water heater consists of a solar collector, a storage tank, and, in most cases, a system of heater: it heats the water or fluid. Depending on the technology used, solar water heating systems can make use of pumps or natural circulation and can use water or other fluids to conduct heat. Thermosyphon systems take out that need for pumps and elaborate controls.

81. Remote Sensing of Beachrock and Other Geomorphological Indicators of Sea-Level Rise on the Island of Lesvos, Greece

*University of Southern Maine*

**AUTHOR:** Anne M. St. Amand  
**FACULTY MENTOR:** Irwin Novak

**ABSTRACT:**  
The use of satellite data for identifying coastal geomorphology is growing, but its implications for paleo-coastal reconstruction within the Mediterranean Basin- an area with known variations in sea-level- are largely undiscovered. In addition to seafloor topography and other geomorphological proxies, cemented calcium carbonate beachrock- an indicator of past sea-level change- has been identified and mapped in this study. Semi-automated methods of beachrock identification used will aid our understanding of these formations and have implications for modelling coastal evolution in the Mediterranean. A previously constructed map, delineating the coastal geology, beach type and slope of half the island, has been updated from vector to raster format, enabling advanced spatial techniques such as panchromatic-fusion, semi-automatic classification, and the creation of spectral indices to identify specific features. This study incorporates new Landsat 8 and SPOT imagery with moderate resolutions of 30m and 10m. In addition to spatio-temporal analysis, these images are draped over Shuttle Radar Topography Mission (SRTM) elevation data (90m resolution) to provide a robust three dimensional model for mapping and correlation. Oblique and vertical aerial imagery of the Lesvos coast are employed to establish semi-automated classification methods, verify geomorphological analyses, and discern between beachrock and other features such as coral reefs.

82. Dexterous Prosthetic Foot Design

*University of Southern Maine*

**AUTHORS:** Zachary J. Stewart, Matthew A. Gordon, Kevin A. Hutchens, David J. Manzenberger  
**FACULTY MENTOR:** Rocco A. Sbardella

**ABSTRACT:**  
Modern day solutions to lower limb replacement come at large cost while providing little replaced functionality. In this project, a prosthetic foot structure is designed and tested that advances current technology by using affordable fused deposition modeling thermoplastics. Overall design criteria are low weight and minimal cost of goods while maintaining robust structural integrity. Along with the prosthetic foot structure design the group will also be conducting a test on the material characteristics of fused deposition thermoplastics. After conducting the material analysis the results will be used to further develop the prosthetic foot design.

83. Tesseract Optical Character Recognition Software

*University of Southern Maine*

**AUTHOR:** Joshua M. Suitter  
**FACULTY MENTOR:** Mariusz Jankowski

**ABSTRACT:**  
Tesseract is an open-source OCR (Optical Character Recognition) software engine originally developed by HP between 1985 and 1995, it is now sponsored by Google Projects (Google Tesseract). Their website has everything necessary to download and operate this freeware, as well as projects people have already worked on using Tesseract. While Tesseract is known as one of the most accurate free OCR engines
available today it has numerous limitations that dramatically affect its performance, its ability to correctly recognize characters in a scan or image. During my research I have found that certain fonts are accepted more than others, and font size, spacing, and image quality all play a role in how Tesseract performs. In this project, I will also be looking into Wolfram’s Mathematica built-in Tesseract code: TextRecognize. The goal is to obtain measures of the program’s recognition performance and to develop and demonstrate preprocessing strategies to improve performance.

84. The Smooth Operator: Backyard Ice Resurfacer

*University of Southern Maine*

**AUTHORS:** MacKenzie Sullivan, Nathan Goodrich, Ryan Pulver

**FACULTY MENTOR:** Mehrdaad Ghorashi

**ABSTRACT:**
Outdoor skating rinks are popular in cold areas during the winter months for recreational use, but unlike indoor ice, divots and imperfections in the surface are not easily managed. Ice Resurfacing machines solve this problem by shaving down the ice and replacing the top layer with a thin layer of water which freezes into a smooth surface once it comes in contact with the existing ice. Research indicates a lack of solutions for smaller and backyard rinks. The problem with traditional machines is they are so big, heavy, and expensive. They are not practical for home use on an outdoor rink that will be used for only a few months out of the year. The solution to this problem is a light, transportable, inexpensive zamboni that can be used for outdoor rinks. The Smooth Operator will scrape the ice and deposit a smooth layer of water all while being operated by a single person and available for purchase for just a few hundred dollars. With almost no competitors in the market, this device could be very popular.

85. Utilization of an Electronic Best Practice Advisory Impacts Brain Computed Tomography in an Academic Emergency Department Setting

*University of Southern Maine*

**AUTHOR:** Donald Szlosek

**FACULTY MENTOR:** Andrew Coburn

**ABSTRACT:**
More than 1.3 million people seek emergency care following a mild traumatic brain injury (MTBI) each year. While most MTBI patients are safely discharged, a small proportion experience serious intracranial processes. The wide availability of computed tomography (CT) has generated a dramatic increase in the number of CTs performed to identify those patients with clinically important traumatic brain injury (cTBI), generating expense and radiation exposure risks for patients. To address unwarranted variation in practice, we implemented an electronic best practice advisory (eBPA) based upon a validated clinical prediction rule that appears when emergency department (ED) clinicians order CT following MTBI.

86. Extendable Wind Turbine

*University of Southern Maine*

**AUTHORS:** Kilton Tabor, Nathan Lareau, Lagu J. Luka, Kristopher Reed

**FACULTY MENTOR:** Mehrdaad Ghorashi

**ABSTRACT:**
In this project, a prototype for a compact version of an Extendable Wind Turbine (EWT) blade is designed and manufactured. This wind turbine is portable for ease of transport to environments that lack an electric power supply. Blade extension increases the length and the surface area of the blade and consequently improves the maximum power that can be generated. By rotating the blades, a generator converts kinetic energy of the turbine into electricity. A full bridge rectifier and a variable speed generator (replacing the classic induction generator) are used to produce usable DC power. The EWT has a functional brake to stop the generator when the wind gets too high. In this way, system failure or producing power that is greater than the design value for the generator is prevented.
87. Noise Control by Structure and Material  
*University of Southern Maine*  
**AUTHOR:** Brian Tarling  
**FACULTY MENTOR:** Lin Lin  

**ABSTRACT:**  
An acoustic impedance testing tube is designed and constructed to test noise absorption properties of selected materials. The structure will be made to be convenient for demonstration purposes and real testing procedures while following ASTM E1050 standards as closely as possible. An engineering drawing as well as a 3D-CAD model of the structure is developed. Testing is conducted on selected materials; mainly ones that will allow obtained results to be compared to results found by other parties. Various sounds will be generated using Mathematica programming: the types of sound will include single frequency, wide band and narrow band noises. Microphones are used, in conjunction with an oscilloscope or computer, to analyze the sound received on either side of the material in the tube. Through data processing various operations and Fourier transforms are performed on the collected sound data. This processing allows for unique characteristics of the materials to be extracted from the data. This data relates the damping effects of the material as they relate to the power and frequency of the noise. The properties of the materials are compared to published material properties. Based on the results, suggestions and ideas for further testing or redesign are reported. Parts that are used or are to be recommended for use are listed.

88. The Phylogeny of Fibroblast Growth Factor Receptors  
*Southern Maine Community College*  
**AUTHORS:** Derek M. Theriault, Lauren Hayden  
**FACULTY MENTOR:** Brian P. Tarbox  

**ABSTRACT:**  
Fibroblast Growth Factor Receptors, FGFR’s, are proteins located on the surface of animal cells. Orthologs of such receptors have been found throughout the Animal Kingdom from worms to humans. Growth factors stimulate these FGFR’s to induce localized physiological responses. Growth factor responses can include cell proliferation, differentiation and cell death. Using five cell line models, three mammalian (human, mouse, dog), an amphibian (frog), and a teleost (zebrafish) as well as tissue from a cartilaginous fish (dogfish shark) we isolated FGFR 1, 2, and 3 specific mRNA to study the evolution of the tyrosine kinase domain of expressed FGFR’s. We used reverse transcriptase PCR to make cDNA and prepared the cDNA for sequencing. Analysis of the sequences reveals that the number of FGFR paralogs increased from one to four probably through gene or genome duplications early in vertebrate evolution. Phylogenetic trees of the tyrosine kinase domain reveal orthologous evolution of the ancestral genes over the course of vertebrate history.

89. Self-Sustaining Radiant Heat  
*University of Southern Maine*  
**AUTHORS:** Brady Therrien, Ihsan Abdulhussain, Brandon White  
**FACULTY MENTOR:** Mehrdaad Ghorashi  

**ABSTRACT:**  
In Maine, one of the most dangerous elements to deal with is ice on roads and driveways. The current method for dealing with these issues is by plowing and salting. The main objective of this project is to reduce the adverse environmental effects of such methods. To this end, melting ice is planned. The designed system is self-sustained by solar panels that are placed on electric poles. When temperature drops below a certain level, the system powers electric cables that are embedded in asphalt. The aim is to heat the top surface of asphalt to above freezing temperature. The system will be on before, during and after a storm and will provide safer conditions for people in colder climates.
90. "Assemble to Caps and Offload" Machine for Lanco Assembly Systems

*University of Southern Maine*

**AUTHOR:** Nathan J. Thurlow  
**FACULTY MENTOR:** Lin Lin

**ABSTRACT:**
The purpose of this project was to design a machine for a local company in order to gain experience in the field of engineering. The local company which sponsored this project was Lanco Assembly Systems which is an automation engineering company based out of Westbrook, Maine. The machine being designed is part of an automated production line which assembles inverted liquid pumps. This machine is at the end of the production line and assembles the pumps to their plastic dust caps and then offloads them from the production line. It starts by picking up the pumps off of a Lanco production pallet, and then using a pneumatic gantry system lifts and moves the caps over to the plastic caps. The plastic caps are fed in on a conveyor belt open-end up. This is done so that when the caps are placed in an escapement the pumps can simply be pressed into the caps in order to properly snap them together. Once the caps and the pumps are together, the pneumatic gantry lifts the pumps and brings them over to an offload chute where it releases them. The pumps drop onto another conveyor where they are fed out of the production line and into cardboard boxes. This project involves the design, manufacturing, and testing of this machine.

91. Bacteriophage Genome Sequencing and Characterization of Halomonas sp. Î¹OM3-ST from Mono Lake, California

*University of Southern Maine*

**AUTHORS:** Danny B. Tomkinson, S. Monroe Duboise, Naun Lobo, Karen Moulton  
**FACULTY MENTOR:** S. Monroe Duboise

**ABSTRACT:**
The halomonas sp. bacteriophage Î¹OM3-ST from Mono Lake, CA, was first isolated and imaged via transmission electron microscopy by the Duboise Virology Laboratory at USM in 2012. Despite a harsh, hypersaline, and high pH living environment, this soda lake hosts an abundance of bacterial life as well as their bacteriophage viral counterparts. By completing the genomic sequence of the halomonas sp. phage Î¹OM3-ST virus, which infects a halomonas sp. most closely related to halomonas sp. GFAJ-1, this study may shed light on both the biology of microbial life in soda lakes here on Earth and the potential of life in extreme environments beyond our own biosphere. Several genes have already been identified to be conserved both in their genomic location and predicted amino acid sequence within genomes of bacteriophage Idiomarina sp. Î¹1N2-2 and Idiomarina sp. Î¹1M2-2, two viruses found in soda lakes in Kenya that were also isolated by the Duboise Lab. This suggests these halotolerant bacteriophages from different continents carry similar replication mechanisms in their genomes, and in essence, share a common biology and evolution within phages of microbial communities in soda lakes. This study contributes to the growing understanding of the complex interactions of bacterial viruses with their biological hosts and their co-evolution in important ancient terrestrial aquatic ecosystems, as well as the astrobiological implications for the potential of life existing elsewhere in our solar system and beyond.

92. Cardiac Prescreening and Risk of Sudden Cardiac Death in Young Athletes: A Systematic Literature Review

*University of Southern Maine*

**AUTHORS:** Meagan Toussaint, Bethany Sheets  
**FACULTY MENTOR:** Carol Fackler

**ABSTRACT:**
The United States reports up to 4.4 deaths/100,000 per year from Sudden Cardiac Death (SCD). Pre-participation exams (PPE) for athletes are endorsed by some sports governing bodies; however guidelines and recommendations for mandatory inclusion of an electrocardiogram (ECG) are rare. The purpose of this systematic literature review is to review current research evidence examining the relationship between PPEs with or without ECGs and the diagnosis of SCDs in athletes. The search strategy utilized the databases MEDLINE and SPORTDiscus. Key words included Sudden Cardiac Death, Prevention and ECG. A final sample of eight studies met the inclusion criteria of: participation in activities requiring PPEs, years 2000-2014, any age/gender, and English language. Exclusion criteria
included: no previously diagnosed chronic disease including cardiac conditions. Preliminary findings indicate the increase in detection of heart abnormalities in athletes who have PPEs that include ECGs, may not be significant enough for clinical practice change. Further research is needed to determine cost effectiveness of such change. This review will aid in developing conclusions regarding whether the use of ECG in PPEs will help identify cardiac anomalies that would eventually lead to SCD in young athletes. Recommendations from this review may also be used in the formulation of new guidelines for clinical practice and identification of areas where further research is needed.

93. Regenerative Bicycle Braking System  
*University of Southern Maine*  
**AUTHORS:** Ryker L. Turcotte, Cody April  
**FACULTY MENTOR:** Mehrdaad Ghorashi  

**ABSTRACT:**  
There is an ever increasing need to continuously maintain a charge on small electronic devices throughout the day. The purpose of this project is to harvest the wasted energy during the braking phase of riding a bicycle. An electro-mechanical energy conversion system has been designed to convert rotational kinetic energy to useful electrical energy rather than being wasted through heat. This energy will then be used to charge electronic devices. The next phase of this project is to modify the design to make it a universal product for bicycle models.

94. Arduino Analog Signal Acquisition using Mathematica 10  
*University of Southern Maine*  
**AUTHORS:** Ryan Turner, Collin Sage  
**FACULTY MENTOR:** Mariusz Jankowski  

**ABSTRACT:**  
The goal of this project is to create a cheap, but useful oscilloscope that can be interfaced with Mathematica 10. The Arduino Uno will be used as the data acquisition device. The project will involve not only the writing of Mathematica and Arduino code, but it will also involve research into the various options of communicating from a slave device to a host device.

95. Developing a Blind Spot Monitoring System for Road Cyclists  
*University of Southern Maine*  
**AUTHORS:** John Vandoloski, Henry Brown, Travis Hale, and Timothy Holt  
**FACULTY MENTOR:** Mehrdaad Ghorashi  

**ABSTRACT:**  
The National Highway Traffic Safety Administration (NHTSA) estimates that 49,000 road cyclists are injured and another 700 are killed by motor vehicles annually. One way to reduce these numbers is to address the lack of blind spot awareness of road cyclists. Research indicates that there exists no consumer device that directly addresses this matter and for this project, a working prototype of a device that improves the environmental awareness of road cyclists is manufactured. This device reduces the reaction time of cyclists by alerting them about the objects that are within both rear blind spots. This task is accomplished by a system of rear sensors in conjunction with feedback systems which will provide the rider heightened awareness while allowing them to maintain complete focus on the road ahead. The design is to be robust enough to operate in moderately adverse weather conditions.

96. Dual-Axis Tracking Multi-Junction Solar Collector For Efficient Solar Conversion  
*University of Southern Maine*  
**AUTHORS:** Kevin M. Wacker, Philip W. Swanson  
**FACULTY MENTOR:** Mustafa Guvench
ABSTRACT:
Inexpensive photovoltaic (PV) arrays are inherently inefficient, however, higher efficiency multi-junction PV cells are available at an increased cost. One method of reducing the cost yet yielding a higher efficiency is through a concentrating device that reflects sunlight onto a smaller area. Using this method greatly reduces the surface area of the multi-junction PV cell needed to collect the solar radiation allowing the higher efficiency panels to be utilized economically. When using concentrated solar radiation cooling of the panel becomes an issue because there is a reduction in performance proportional to temperature. Using a heat sink to remove excess heat from the PV cell improves efficiency and also provides the opportunity to use the excess heat for other applications, namely space heating, water heating, or water purification. Utilizing relatively inexpensive common materials and simple manufacturing processes it was demonstrated that using a parabolic dish to concentrate solar radiation onto multi-junction solar cell will produce an electrical output. The efficiency of conversion far exceeds that obtained using traditional mono-crystalline silicon based photovoltaics. In addition, a proof of concept design was developed to support the parabolic dish, solar cell while tracking the sun using a dual-axis quadrant based solar tracker.

97. An Interprofessional Approach to Prenatal Exercise in Low-Income Women
University of Southern Maine
AUTHOR: Maryalice H. Walker
FACULTY MENTOR: Carol Fackler

ABSTRACT:
Prenatal obesity puts women at risk for adverse pregnancy outcomes and confers upon their infants an increased childhood obesity risk. Low-income women are less likely to exercise in pregnancy and have higher rates of prenatal obesity than their more affluent counterparts. The literature suggests low-income women are aware of the value of prenatal exercise but lack information about what kinds of physical activity are beneficial and safe. Additional barriers to prenatal exercise in this population include unsafe neighborhoods and lack of facilities and social support. Implications of current research findings include discussing specific prenatal exercise recommendations with patients. Accessible, safe spaces with group exercise and education programs might facilitate prenatal exercise in this population. An interprofessional approach addressing the implications of current evidence might include the expertise of primary care providers, nurses, health professions students, and community centers. Outcome measures to evaluate the efficacy of the interprofessional approach would include progress made toward nationally recognized prenatal exercise recommendations, healthy prenatal weight gain, and women’s knowledge, self-efficacy, and feelings of support.

98. Documenting the Transfer of Aquatic Nutrients to Riparian Habitats via Stable Isotope Analysis of Spider Diets
University of Southern Maine
AUTHORS: Amy Webb, Margret Welch
FACULTY MENTOR: Karen Wilson

ABSTRACT:
The transfer of nutrients between habitats is an important ecosystem process. The goal of this project was to determine if riparian spider diets were subsidized by aquatic production (i.e. nutrients) using δ13C and δ15N values. Ground and web dwelling spiders, potential prey items and primary producers were collected from forest and riparian habitats. All samples were analyzed for δ13C and δ15N values. We found a significant difference in the δ13C signatures of the spiders between habitats and a significant difference in the δ15N signatures between web vs. ground dwelling spiders (p=0.0063, & p=0.0437, respectively). Our research shows that riparian spiders exhibit a carbon isotope signature shifted more towards a freshwater signature, most likely due to consumption of emerging aquatic insects. This suggests that riparian spiders subsidize their diets with aquatic food sources.

99. Defining the Role of microRNA 199b in Acute Myeloid Lukemia
Maine Medical Center Research Institute
AUTHORS: Anna Whitaker, Amanda Favreau, Rose McGlaufflin, Sathyanarayana, Ph.D, Calvin Vary, Ph.D
FACULTY MENTOR: Pradeep Sathyanarayana, Ph.D.

ABSTRACT:
Acute myeloid leukemia (AML) affects over 20,000 people a year and manifests with a marked heterogeneity in both responses to therapy and patient survival, outcomes that likely reflect its varied pathogenesis. AML is a cancer that starts inside bone marrow, the soft tissue inside bones that helps form blood cells. This cancer grows from cells that would normally turn into white blood cells. Accumulation of several genetic changes or mutations in the cell that lead to increased or decreased levels of key regulatory proteins drives this pathological process. MicroRNAs, or small ribonucleic acid molecules that can inhibit protein synthesis, are emerging as important factors in the pathophysiology of cancer, including leukemias. Detailed understanding of microRNA’s role in leukemia needs to be established in order to fully explore their therapeutic utility. These experiments study the molecular mechanisms of AML in hopes of being able to refine therapeutics for patients. A transgenic mouse that does not express microRNA-199b (miR-199b) is being developed using CRISPR technology to study the effects of miR-199b in AML. Protein analysis was done by mass spectrometry to identify specific proteins targeted by increased amount of miR-199b. The most prevalent proteins were studied in an attempt to understand their function in AML.

100. Characterization of Murine Monoclonal Antibody 2A07 Produced against Human C-Terminal Osteopontin

University of Southern Maine

AUTHOR: Molly White

FACULTY MENTOR: Ashley Lucas

ABSTRACT:
Osteopontin (OPN) is a phosphorylated glycoprotein that is present in tissue and body fluids. This protein has many functions, including wound healing, regulating tumorigenesis, tissue remodeling and repair, and immune response. Tumor cells in a variety of cancers have been shown to express OPN, including prostate, colon, breast, stomach, lung, liver, mesotheliomas, multiple myeloma, squamous cell carcinomas, and sarcomas. When OPN binds to CD44 or integrins, processes such as cell survival, invasion, adhesion, and migration can be affected. It is also indicated that the same integrin family can be activated by different OPN ligands and initiate separate signaling cascades. Multiple studies indicate that OPN has potential to serve as a noninvasive biomarker for cancer diagnosis, monitoring, treatment, and the development of therapeutics. A series of antibodies were produced against human recombinant c-terminal OPN (C-OPN), including monoclonal antibody 2A07 that is used in this study. Multiple assays using a variety of techniques were utilized in this study to characterize this antibody. Anti-C-OPN monoclonal antibody 2A07 was evaluated by ELISA, western blot, fluorescent microscopy, and flow cytometry. The results of this study indicate that 2A07 has a high affinity for C-OPN and is suitable for the evaluation of C-OPN interaction with ligands such as CD-44 and integrins. Additional evaluation of this antibody is needed for further characterization of the affects 2A07 has on OPN.

101. Building Betaport: A virtual city

University of Southern Maine

AUTHOR: Caroline P. Whitman

FACULTY MENTOR: Glenn Wilson

ABSTRACT:
Websites are used to represent companies to a large demographic of people. Companies will typically outline what they want on their website to a web developer, who will then bring the website into existence. But how does one create a website for a company that doesn’t exist? This poster addresses the design process and execution of building a website for a company that doesn’t exist for a virtual town called Betaport. The goal for this virtual town is to provide a place where people can be educated and experiment in cyber security.

102. The Viability of an Electric Car Infrastructure at USM Campuses

University of Southern Maine

AUTHORS: Lisa Willey, Darcy Cooke, Jade Deshaies

FACULTY MENTOR: Travis P. Wagner
THINKING MATTERS 2015- POSTER SESSIONS

ABSTRACT:

We are an Environmental Communication (ESP 203) student group who wants to address the need for developing renewable energy infrastructures in order to promote new energy sources and reduce our reliance on fossil fuels. We will focus specifically on electric car charging stations. Our hypothesis is that many people are deterred from buying electric or electric hybrid vehicles because of the lack of available charging stations. If these charging stations were easier to access, we believe that we would see a rise in the number of people driving electric cars. We are testing this hypothesis by surveying USM students (commuter and residential), faculty, and staff and asking them what they think about the idea of having electric car charging stations available on campus. According to our theory, a majority of the drivers surveyed will say that if charging stations were available on campus they would be more likely to consider purchasing or leasing an electric vehicle. Our survey method involves positioning ourselves at parking lots and the garage on Portland and Gorham campuses. That way we will be certain that the survey participants have driven to the campus, and are therefore commuters. The questions on the survey address the length of commute, whether or not the driver owns/leases an electric car, how much should USM invest in the stations, and whether or not the driver would be more likely to purchase/lease an electric car.

103. Thermoacoustic Refrigerator

University of Southern Maine

AUTHORS: Nicholas B. Williams, Hector Ortiz

FACULTY MENTOR: Lin Lin

ABSTRACT:

Thermoacoustics bridges the gap between two important subjects in engineering and also a variety of other subjects. Using a simple speaker as a driver, the project is able to show that temperature differentials can be obtained using sound alone. An Arduino microcontroller was utilized to generate the audio signal and record temperature data. Using a tube, speaker, and a porous stack, refrigeration can be achieved by the use of sound waves. Once built, the resonant frequency of the tube was used to test for a temperature differential on either side of the stack, located at approximately one quarter the wavelength of the resonant frequency of the pipe. Upon further adjustments of the frequency and stack position, temperature differentials were obtained on the order of 7-15° F. When applying heat to the bottom of the stack, temperatures were seen on the order of 95-185° F difference.

104. Examination of Motivations Related to Dosage of Volunteer Engagement

University of Southern Maine

AUTHORS: Wayne C. Williams, Thomas P. Collins, Cheri J. Crossman, Deidre Donchian, Caleb M. Gilbert, Lisa S. King, Natalie K. Reisinger

FACULTY MENTOR: Charles A. Smith

ABSTRACT:

There exists a wide body of research related to the beneficial impacts of volunteer engagement. The literature suggests that volunteerism has two distinct avenues of benefits: 1) individuals themselves may benefit from volunteering, with volunteerism widely correlated with greater levels of health status and social engagement and 2) wide ranging social benefits that can be accrued by resource strapped community agencies by means of utilizing the skills, time, and expertise of volunteers. While volunteerism is widely seen as having multiple beneficial impacts, the reality is that levels of volunteer engagement among older adults are lower on average than their peers in the 40-60 age range, and have not grown in recent decades along with improved health status of older adults. Volunteer coordinators, and public agencies, view older adults as an untapped resource for providing assistance to all sectors of the population. This study intends to look for dose dependent motivational responses to volunteer engagement. After controlling for other known predictors of volunteer engagement (e.g., health status, social economic status, pro-social orientation, free time), how do a variety of motivational factors vary as a function of the time/intensity demands associated with a specific volunteer activity? The study itself is an on-line cross sectional self-administered survey distributed through the Osher Lifelong Learning Institute, as well as snowball sampling among populations known to members of the research class.
105. Topological Manifolds  
*University of Southern Maine*  
**AUTHOR:** Grant M. Wilson II  
**FACULTY MENTOR:** Laurie Woodman  

**ABSTRACT:**  
Topological Manifolds are abstract spaces that locally resemble Euclidean space. For example, consider a round globe and a flat map. The map is a 2-dimensional representation of a 3-dimensional space. Given any point on the globe we can find a corresponding position on the map, and vice versa. This correspondence is called a chart. With a sufficient number of charts, we can describe the whole space. Such a collection of charts is called an Atlas. It is possible to construct different Atlases for the same space, allowing us to move from one chart, to the space, to another chart. This process is called a transition map. The areas of focus for this project include several examples of manifolds such as curves, n-spheres, and the torus. We will explore and illustrate different approaches to charts on these manifolds, the properties of a manifold, examples of spaces that fail to meet these requirements, and the derivation of transition maps.

106. The Truman Show: Scalable Generation of Artificial Network Traffic for Cyber Security Research  
*University of Southern Maine*  
**AUTHORS:** Adam O. Wirth, Isaiah C. Marvin  
**FACULTY MENTOR:** Glenn Wilson  

**ABSTRACT:**  
Network traffic generation is a key component of the creation of a network simulation environment. In order to create a realistic simulation of a large scale network in action, it is necessary to have a large volume of user traffic. Past methods for providing user traffic, such as hiring users to manually generate traffic, or recording existing traffic of an active network, provide limited control. Managing and directing users is time consuming, and using existing traffic is restricted by recorded conditions. The Truman Show project provides an infinitely adjustable alternative by utilizing agent based modeling of individual users. An agent based model is a statistical method for modeling a system not as a single object, but as numerous subsystems. The Truman Show uses a similar methodology for the generation of network traffic by generating activity not from a single recording, or small handful of users, but with the creation of a master program that generates an infinitely scalable number of subprograms, each of which mimic real user behaviors.

107. PC and Microprocessor Controlled Programmable Wafer Spinner for Semiconductor Wafer Fabrication  
*University of Southern Maine*  
**AUTHOR:** Mao Ye  
**FACULTY MENTOR:** Mustafa Guvench  

**ABSTRACT:**  
Wafer spinners are employed in Semiconductor Integrated Circuit fabrication to uniformly coat a Silicon wafer with a material dissolved in a solvent by applying it in liquid form and spinning it to spread it to a desired thickness and dry it. Photo-resists and dopant materials are spun on Silicon wafers using this technique. Our wafer spinner design employs a DC motor driven by an analog power amplifier to spin at a speed controlled by a voltage. In this project we have designed, verified and installed programmable controllers to control spinning speed as a function of time in accordance with a process recipe. Final design implemented gives the user three options, 1. Manual speed control, 2. Built-in microprocessor control from a keypad typed recipe, 3. PC control via a USB-DAQ interface board using LabView programmed GUI window with on screen graphics to monitor the progress of the spinning process. The GUI provides the user the convenience to pick/vary all the parameters of the process sequence and includes safety features. The tool has been successfully used for spin-coating of Silicon wafers in our Microfabrication laboratory.
108. Polyaniline-Perylene Solar Cell At Room Temperature

University of Southern Maine

AUTHOR: Deedra Zeeh
FACULTY MENTOR: James Masi

ABSTRACT:
With the advent of relatively stable organic semiconductors and graphene (or other nanotube or fullerene morphologies), it is possible to fabricate photovoltaic cells at near room temperature. By stacking these cells, devices of reasonable efficiencies >5% can be fabricated. Devices were created with a perylene-P3HT photoactive layer, polyaniline buffer layer, and PEDOT:PSS as the hole transport material. Devices were fabricated, tested for J-V characteristics, and re-designed for a final structure.