

PROGRAM AND ABSTRACTS

Wichita State University

12th Annual

UNDERGRADUATE RESEARCH AND CREATIVE ACTIVITY FORUM—URCAF



APRIL 3, 2012

RHATIGAN STUDENT CENTER

2012 URCA FORUM

Organizing Committee

Chair: Lawrence Whitman, Professor, Engineering
Steven Oare, Associate Professor, Fine Arts
Douglas Parham, Assistant Professor, Health Professions
Masud Chand, Assistant Professor, Business
Jay Price, Associate Professor, LAS Humanities
Hussein Hamdeh, Professor, LAS Math/Natural Sciences
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Wichita State University
12th Annual Forum
Undergraduate Research and Creative Activity Forum—URCAF

Note: Performance/Creative Activity will be in the RSC Ballroom, posters will be in first floor hallways, presentations will be in RSC 203)

URCAF - RSC	
9:30 – 12:00	Natural Sci./Eng. – RSC 203
11:30 – 12:00	Performance/Creative Activity, RSC Room Ballroom
1:00 – 2:15	Social Sciences, RSC 203
10:00 – 12:00	Viewing Posters (RSC Hallway)
3:00 – 3:30	Awards Presentation, RSC 203

URCAF Natural Sciences Session
Moderator: Masud Chand
Judges: Esra Buyuktahtakin, Terry Behrendt, Nils Hakansson
RSC 203

9:30	Christopher Carithers	Which Software Bugs Should I Fix and in what Order?
9:45	Timothy Eberl	Isolation and Characterization of Epsotolerant Aerobic Microbes from the Magnesium Sulfate Environment of Hot Lake, WA
10:00	John Kromer	Trispyrazolylborate Models for Nickel Superoxide Dismutase
10:15	Pie Pichetsurnthorn	Detection Of Anthrax Protective Antigen Using a Nanoporous Impedemetric Biosenso
10:30	Zach Quick	The Effect of Herbivory and soil fertility on the Reproductive Success of Helianthus maximiliani
10:45	Emily Rose	Characterization of Recombinant hFSH Glycosylation
11:00	Dean Simkins	Using Google Earth to Classify Fire Service Flights through Visual Inspection
11:15	Dean Simkins	Obtaining Altitude above Ground for Flight Data Using Google Earth and Python
11:30	Michael Staab	Analysis and Optimization of Axisymmetric Supersonic Inlets for RBCC Propulsion
11:45	Prince Yengbe	Analysis of Flight Data From Beechcraft King Airs Used in Aerial Forest Fighting

URCAF Exhibition/Performance Session
Moderator: Steven Oare
Judges: Aleksander Sternfeld-Dunn, Rachel Crane
RSC Ballroom

11:30	Elizabeth Chippeaux	Virtuosity and Beauty
11:45	Emily Sippel	The Answers are Hiding Within the Parallels of My Questions.

URCAF Humanities and Social Sciences Session
Moderator : Jay Price
Judges: Francisco Flores-Cuautle, Sharon Goodvin, Craig Torbenson
RSC 203

1:00	Creighton Coleman	The Making of an Arab Spring
1:15	Mathias Dorbayi	Monster Drink
1:30	Troyce Hefley	Determinants of Film Success at the Box-Office
1:45	Elena Nightingale	Role-Focused Instruction and the Participation Level of English Language Learners
2:00	Rebecca Rodriguez	A World Apart: Bullying in a Middle School Culture

URCAF Poster Presentations
UPSE Judges: Lyndsay Smanz, Gemma Blackburn, Douglas Parham
USSS Judges: Hussein Hamdeh, Douglas Parham
First Floor RSC Hallways

UPSE1	Bishal Bista	Isolation and Characterization of Anaerobes from Hot Lake, WA
UPSE2	Hui Chow	Hybrid Eddy Current Brake for High Speed Vehicle
UPSE3	Donna Dodd	Older Women's Understanding of Moderate-Intensity Physical Activity
UPSE4	Tate Lampe	An Energy Efficient Asset Replacement Model Including Multiple Asset Types.
UPSE5	Ali Sanderson	Lower Lip and Jaw Speed Capacity of Young, Middle-Aged, and Older Adults
UPSS1	Cliff Bragg	Students' Use of an Objective Protocol to Measure Swallowing: Accuracy and Implications
UPSS2	Kei-Ashia Cosey	Social Work Programs and their use of Social Media Sites
UPSS3	Taryn Hoge	Benefits of Using iApps Across Demographics

Bishal Bista, Namrata Bhoomi Shrestha, Karen Woltersdorf
Faculty Sponsor: Mark Schneegurt
Biological Science (Microbiology)

Isolation and Characterization of Anaerobes from Hot Lake, WA

The presence of sulfate salts and limited subsurface water (ice) on Mars suggests that any liquid water on Mars today will occur as (magnesium) sulfate-rich brines. It is not clear whether terrestrial organisms would be able to survive under the salinity and environmental conditions found on Mars. Hot Lake near Oroville, Washington, is a hypersaline terrestrial analogue site, which possesses chemical and physical properties similar to those observed on Mars. The main focus of this project is to characterize anaerobic microbial isolates from this meromictic athalassohaline epsomite lake that contains precipitating concentrations of $MgSO_4$ (Epsom salt). The salinities of soil samples from Hot Lake margins ranged from 4 to 32%. Hot Lake soils were used to inoculate growth media specific for fermentative organisms and sulfate-reducers. The cultures were maintained anaerobically at room temperature as well as at 7 °C. Microbial isolates from these enrichment cultures will be obtained by repetitive streak plating. The isolates will be characterized phenetically and phylogenetically. Tolerance to NaCl and $MgSO_4$ appears broad in aerobic Hot Lake isolates, but halophilic or epsophilic organisms do not appear to be abundant. The Hot Lake microbial community is dominated by bacteria often associated with hypersaline environments rich in NaCl and $MgSO_4$ rather than common soil organisms, novel phyla, or archaea. The isolated microbes have potential biotechnological as sources for enzymes and bioactive compounds. The results of this study will help to inform NASA's planetary protection group and has significant relevance to the origin of life on Earth.

Cliff Bragg
Faculty Sponsor: Lynette Goldberg
Communications Sciences and Disorders

Students' use of an objective protocol to measure swallowing: Accuracy and implications

Inter-rater reliability remains disappointingly low when clinicians evaluate filmed evaluations of persons with swallowing disorders. To address this concern, investigators have developed two protocols - one which measures the transit of food or liquid from the mouth to the esophagus at 17 landmarks and one which measures the same transit but at 5 landmarks. The current study examines the accuracy of two groups of student clinicians as they applied the 5-landmark protocol to a videofluoroscopic evaluation of a problematic swallow after a brief period of training. Data currently are being analyzed. If data show a statistically significant ($p < 0.05$) relationship between the measures documented by the two groups of students, results will suggest that students with little clinical experience are able to learn and accurately apply the 5-landmark protocol. Further, this 5-landmark protocol will be a useful teaching tool in the preparation of students for clinical practice and to facilitate increased inter-rater reliability in swallowing evaluations.

Christopher Carithers
Faculty Sponsor: Huzefa Kagdi
Electrical Engineering and Computer Science

Which Software Bugs Should I Fix and in what Order?

Software quality is often associated with bugs. It is not uncommon in a large open source system to have hundreds of bugs reported daily. In order to sustain a quality evolution of the systems, bugs are needed to be fixed in the next release (often constrained with time and budget). One of the fundamental problems in the software engineering research is to determine whether a bug will be fixed (or not) in the next release. Furthermore, once this determination is made, the exact order in which they will be fixed is also needed, so that software maintenance activities can be appropriately planned and allocated. A machine learning approach that takes into account a number of features from bug reports and derives an automatic classifier to solve this problem is proposed. The presentation will focus on a preliminary investigation using Decision Tree and Linear Regression as the underlying mechanics of machine learning. This approach was applied to Android, which is a popular open source platform for mobile devices. We successfully predicted 5 bugs that were fixed after December 6, 2011. There were a total of 23 bugs fixed. This result on a real world system is quite promising. Future work includes an examination of advanced machine learning techniques, such as Support Vector Machines, and a rigorous empirical evaluation of the proposed approach.

Elizabeth Chippeaux
Faculty Sponsor: Julie Bees
School of Fine Arts: Music

Virtuosity and Beauty

Instrumental music is a form of communication that can communicate with all people no matter what their language. But just like learning a new language, mastering the skill of an instrument takes years of practice to gain proficiency. Performing classical music is very much like being an actor, you must stay true to the ideas and concepts of the composer while your own person and experience influences what you use the music to communicate. Classical music is a collaboration between two people: the composer and the performer. These two people come from different cultures, with different life experiences, from different times in history; but they share the same emotions and struggles that all people experience. Because of the magic and beauty of music, this incredible collaboration has the power to communicate with an audience in a way verbal language cannot. The piano works that you will hear were written by composers who were extremely proficient keyboard players from different points in history and different countries. Because of their different backgrounds, their virtuosity is displayed in different ways.

Hui Chow
Faculty Sponsor: Asrat Teshome
Engineering of College

Hybrid Eddy Current Brake for High Speed Vehicle

Eddy current brake (ECB) is a contactless solution that generates counter force created by eddy current which in turn is excited by a relative motion between a conductor and a magnetic field. It is wear-free, less-sensitive to temperature, has fast and simple actuation, and has a reduced sensitivity to wheel-lock. The present ECBs in the market are designed to be a stand-alone facility that operates as a retarder and require additional volume in the vehicle and thus received limited success. This design project is to design an ECB that offers a complete solution to replace conventional friction brake used in high speed and heaving weight vehicle. The study starts with a review of the fundamental physic of the eddy current phenomenon. Then based on published study and research, identify the impact of each design parameter, seek possible improvement over present design, and propose a new design concept of a compact brake system that integrates eddy current brake and friction brake with electromagnetic actuator that shares the same electromagnet without the need of hydraulic system. The new design takes advantages of the ECB's higher resistant to heat and allow the friction brake to operate at lower temperature thus offer a more efficient and safety alternative to conventional friction brake. The project is now at preliminary design stage and is planned to undertake a detail FEM modeling and other refinement before entering the next detail design stage.

Creighton Coleman
Faculty Sponsor: Dinorah Azpuru
Political Science

The Making of an Arab Spring

While the beginning of the Arab Spring has been attributed to Tunisian street cart vendor, Muhamed Bouazizi, many variables, including pre-existing conditions, played a role in the mass mobilization in Tunisia and the rest of the Arab World. Following the unrest in Tunisia in January 2011, several other Arab countries began experiencing different levels of mobilization. This research seeks to establish what variables were most significant in determining different levels of unrest in that region. Multiple variables are considered and tested in both bivariate and regression analysis. The research attempts to explain what factors account for different levels of mobilization in Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, the United Arab Emirates, and Yemen. Our research shows that the GDP per capita of a country and the existing level of corruption are significantly correlated with the different levels of mobilization.

Kei-Ashia Cosey
Faculty Sponsor: Brien Bolin
School of Social Work

Social Work Programs and their Use of Social Media Sites

This research focuses on how university social work programs are using social media sites, such as Facebook, twitter, and YouTube, to either promote their programs or advocate for change. Key points of focus will include, but are not limited to: what the programs are advocating for, what events and organizations are being promoted, and what school information is being published publicly. By examining in what ways these programs are making use of social media technology, researchers will be able to identify what trends, if any, exist. Once the data collection is completed, we will examine what areas of the programs are being promoted the most and if the social media sites are having a positive impact on the university social work programs. It is our hope that research gathered here will provide data and information necessary for improving the programs' means of advocacy and self-promotion, both for community-specific and university-related purposes.

Donna Dodd, Jennifer Gurnsey, Samuel Ofei-Dodoo
Faculty Sponsor: Nicole Rogers
Psychology

Older Women's Understanding of Moderate-Intensity Physical Activity

BACKGROUND: Being physically inactive can lead to cancer, obesity, cardiovascular disease, and decreased longevity. The American College of Sports Medicine recommends older adults (OA) spend at least 30 minutes, 5 days/week, engaging in moderate intensity (MI) physical activity (MIPA). Unfortunately, research indicates OA spend a considerable time engaging in low-level activity and very little time in MIPA. **PURPOSE:** To investigate if OA are (1) aware of ACSM recommendations; (2) can correctly identify the intensity, duration and frequency of the recommendations; and (3) following a training session, can OA walk at a MI. **METHOD:** Twenty women (XX years) were recruited. Participants completed a questionnaire to test their understanding of the ACSM recommendations. To determine the ability to walk at a MI pace, participants walked wearing a Polar RS100 heart-rate monitor and were instructed to maintain a moderate pace for 10 minutes. Participants were told when their heart rate was at a MI level and were instructed to quicken or slow their pace to maintain MIPA. Four weeks later, participants were asked to demonstrate, without assistance, a MI walking pace for 15 minutes. A participant who maintained a MI pace for at least 10 consecutive minutes was deemed competent. **RESULTS:** Analysis will include descriptives, frequencies, t-tests, and mann-whitneys. **CONCLUSIONS:** A small percentage of older adults will be knowledgeable of the ACSM recommendations. Following training OA will be successful in maintaining a MI pace.

Mathias Dorbayi, Kofi Oppong, Nabin Singh Baniya
Faculty Sponsor: Masud Chand
Business

Monster Drink

Monster energy drink is one of the newly produced beverages that have not yet gain international recognition. My project is aimed at promoting this brand in one of the two countries seemed best. Indonesia and Malaysia are the two countries chosen for this project. My main focus is to pick the best country to market this product. By doing so, I have highlighted the following areas for consideration. 1. Country and city overview to ascertain the best city that is likely to attract larger customers 2. Cultural environment is another key area I want to look at to determined the lifestyles of people in these countries 3. Political and legal environment is another factor to be considered for this very important project. 4. The economic situation in these countries will also help me make the right choice for the product. 5. Analysis of the financial market indicators will be a key for this product. 6. Other competitive brand of energy drink will be considered before a choice is made Besides the above mentioned factors, I am also considering other options to ensure that the product is marketed in the best country with benefits. However, this work is still progress and will be completed appropriately.

Timothy Eberl
Faculty Sponsor: Mark Schneegurt
Biological Sciences

Isolation and Characterization of Epsotolerant Aerobic Microbes from the Magnesium Sulfate Environment of Hot Lake, WA

Hot Lake near Oroville WA is an athallassohaline epsomite lake with precipitating concentrations of $MgSO_4$. Little information is available regarding epsomite lakes and no microbial isolates have yet been characterized as "epsotolerant" or "epsophilic", growing at or requiring high concentrations of $MgSO_4$, respectively. Osmotolerant microbes are typically obtained at high NaCl concentrations (halotolerant), although some are known from environments rich in sugars or other salts. It was unclear whether microbes isolated from epsomite lake environments would be from recognized halotolerant genera, common soil genera, or novel groups. Fresh samples from epsomite-rich Hot Lake, WA, were cultivated in high-salt media based on SP or HM that included 10% $MgSO_4$ or NaCl, 25% NaCl, and 2 M $MgSO_4$ at 25 or 37 °C. Over 100 microbial isolates were obtained from Hot Lake by repetitive streak-plating. Characterization included gene sequencing, Gram and endospore staining, oxidase, catalase, and various fermentations and enzyme assays, among others. Halotolerance and epsotolerance appear broad, although the isolates tended to perform better at lower salinities. Growth was better at higher concentrations of $MgSO_4$ than NaCl, likely due to higher water activities. Enzyme and fermentation assays were mainly negative. The collection is dominated by bacteria, evenly split between Gram-positive and Gram-negative clades. The most abundant genera based in dilution plating were Halomonas, Marinococcus, Planococcus, and these were most abundant among the isolates as well. Members of the high G+C Gram-positive group were isolated including Kocuria, Nesterenkonia, and Nocardiopsis. Study of the microbial ecology of this distinct environment has relevance to the epsomite-rich soils on Mars.

Troyce Hefley, Lauren Durano, Sheradin Fabrizius, Nathan Miller
Faculty Sponsor: Kate Kung-McIntyre
Department of Economics, Department of Management

Determinants of Film Success at the Box-Office

When analyzing film aspects and traits, which ones are most influential in determining box-office success? Using box-office data, our team examined what made the most successful and least successful films in three separate categories: international market, domestic market, and worldwide (international and domestic combined) market. Through general research and regression analysis we were able to determine what specific characteristics create the most box-office success for the international and domestic markets, and ultimately how these work together to create a successful worldwide film. Within the domestic market, traits such as the use of social media and advertising, depth of storyline, established fan bases, and presence of American themes contribute to a film's success. In the international market, films that use producers and directors with foreign film experience, contain broad and diverse cultural themes, are filmed in various global locations, and have leading actors from a variety of countries usually have the greatest success.

Taryn Hoge
Faculty Sponsor: Julie Scherz
Communication Sciences and Disorders, College of Health Professions

Benefits of Using iAPPS Across Demographics

This study was designed to determine the potential benefits of iApps across a varied demographic range. Surveys were constructed to discover how frequently such professionals as speech-language pathologists implement iApps in a therapy setting, and their opinions of the effectiveness of such technology. We also discovered the tendency of college students to use, or not to use, iApps as study aids upon suggestion, and the potential impact certain iApps may or may not have on the quality of life of the aging population given proper training on how to use equipment such as an iPad or tablet. The findings for this study showed that, even though most college students have some form of access to iApps and are members of the cohort most familiar with this technology, they showed a distinct aversion to utilizing iApps as study aids. We also learned that, given the proper training and confidence, members of the aging population can certainly benefit from this form of technology. Finally, it was discovered that just under half of the speech-language pathologists surveyed utilized iApps in a therapy setting, and found them to have at least some success with their clients. At this point, our conclusion about iApps is that their usefulness and effectiveness does not depend on the demographic that is using them, but rather the willingness of the individual to not only use iApps, but to learn how to use them for their proper and intended use.

John Kromer
Faculty Sponsor: David Eichhorn
Chemistry

Trispyrazolylborate Models for Nickel Superoxide Dismutase

Superoxide is a naturally occurring toxin that occurs in oxygen-rich environments. All life that lives in oxygen environments must have a method of eliminating this toxin. The method used by bacteria and mammals is superoxide dismutase (SOD), which is a metal-containing enzyme designed to break down superoxide to molecular oxygen and hydrogen peroxide. This project involves one form of this class of proteins, Nickel SOD. Nickel is a rare element for life to use for this protein and as such, we are trying to study how this protein works to better understand these proteins in general, as well as better understand the unique chemistry involving this element. We will present the results of our attempts to synthesize small nickel compounds as models for the active site of this enzyme.

Tate Lampe
Faculty Sponsor: Ersa Buyuktahtakin
Industrial Engineering Department

An Energy Efficient Asset Replacement Model Including Multiple Asset Types

Many sources of literature have analyzed the parallel replacement problem using non-realistic limits to achieve an applicable replacement schedule for work assets. These include studying the effects of only one kind of asset and allowing an unlimited budget. In this paper, we provide an integer programming model that addresses perceived shortcomings in existing parallel replacement models, and attempt to present a more realistic solution. First, we consider two different types of assets, one that is fully functional and one that is cheaper, but offers limited functionality. Second, we incorporate budget limitations into our integer programming model and then aim to appease a majority of the demand while enforcing a penalty value for each unmet demand. Third, our model includes technological change in the form of increased capacity, and deterioration in the form of lower capacity, lower re-sale value and increased operations and maintenance (O&M) costs. Furthermore, we apply our methodology to magnetic resonance imaging machines. We reviewed many scholarly works to formulate a solvable model and used manufacturer specific product declarations to determine allowable life-span and retail value of our assets. We then coded our model and used AMPL to obtain an efficient replacement schedule for our problem. We discovered many useful ratios in the amount of machines expected in relation to overall demand as well as achievable demand in respect to a fixed budget. By allowing multiple asset types and an un-met demand, this model proves to be very versatile and can be implemented in a variety of situations.

Elena Nightingale
Faculty Sponsor: Kimberly McDowell
College of Education

Role-Focused Instruction and the Participation Level of English Language Learners in Collaborative Environments

Research Question: What is the effect of role-focused instruction on the participation level of English Language Learners in collaborative environments? Methods: This correlational study took place in a 12th grade classroom. Participants included 28 students, of whom 3 were English Language Learners. To gather baseline data, I observed the students in collaborative environments and recorded the participation based on interactive communication occurrences. During the instructional unit, specific instructional strategies were implemented, focused on role-based participation during small-group or whole-group speaking and listening activities. Qualitative data were collected during continued documentation of interactive communication occurrences in the students' behavior, focusing specifically on the participation level of English Language Learners. Findings: The observed participation of the students as a whole class increased during the first of two role-focused activities, and increased significantly after the second activity. For English Language Learners, the participation level increased significantly after the first of the two activities, bringing them to the same level of participation as the rest of the class, and this level was maintained during the second activity. Conclusions: From my active role in creating these instructional environments, I have observed a positive correlation between a role-focus in collaborative work and student participation. From these results I would conclude that this strategy may be an effective way to promote higher levels of participation in collaborative activities.

Pie Pichetsurnthorn, Kiran Andra
Faculty Sponsor: James Bann
Chemistry, Bioengineering

Detection of Anthrax Protective Antigen Using a Nanoporous Impedometric Biosenso

In response to the 2001 bioterrorist attacks involving anthrax, precautionary methods of containment, such as early detection, have been explored in order to better prepare for similar incidences. This project proposes a highly sensitive and efficient approach in which aspects of cell protein interaction and electrical circuits are combined in nanoporous impedometric biosensors to detect traces of anthrax toxin through the presence of its protective antigen. The anthrax toxin is comprised of a protective antigen (PA), lethal factor (LF), and edema factor (EF). The presence of both PA and LF is lethal and if left untreated could lead to death 2-3 days after exposure. In order for toxin to enter the cell, PA binds to the toxin receptor capillary morphogenesis protein (CMG2) on cell surfaces. By simulating the specific PA- CMG2 binding on the gold circuit of a printed circuit board chip, detection can be quantitatively measured using Electrochemical Impedance Spectroscopy (EIS) from the capacitance created in the assay. The change in impedance corresponds to the amount of PA bound to CMG2 and thus PA's relative concentration. The biosensors have shown a detection limit at 1ag/ml of PA in phosphate buffer solution and in human serum. Such sensitive detection at low concentrations shows promise for rapid response in a case of potential anthrax toxemia.

Zach Quick
Faculty Sponsor: Greg Houseman
Biology

The Effect of Herbivory and soil fertility on the Reproductive Success of *Helianthus maximiliani*

Although it is known that herbivores influence plant fitness, there is relatively little information quantifying the combined effects of multiple herbivore groups on reproductive success and determining whether such effects may vary with plant nutrient status. *Helianthus maximiliani*, is a highly nutritious perennial plant sought after by a variety of organisms in prairies. To study the impact of herbivore diversity on the fitness of *H. maximiliani*, different herbivore groups were excluded from plots in a restored prairie near Viola, Kansas. Plots were randomly assigned to various herbivore exclusion treatments designed to protect plants from insect, above ground, and below ground mammal activity. Each herbivory treatment was crossed with either ambient or soil fertilization treatments. Although insects had no detectable effect on any measure of fitness, plants were taller when protected from above ground mammals, but only at high soil fertility. This pattern suggests that herbivores such as deer selectively feed on the most nutritious plants available. For reproduction, the number of seeds/flower head and germination rates were similar regardless of herbivory or soil fertility. However, the number of flower heads/plant increased with plant size and this ratio increased with enhanced soil fertility. These data suggest that, under higher resource conditions, *H. maximiliani* maximizes flower head production rather than allocating additional resources to seed quantity or quality. Furthermore, reduction in plant size due to mammalian herbivores does not translate to reduced reproductive potential because of compensatory flower head production.

Rebecca Rodriguez
Faculty Sponsor: Ron Matson
Sociology

A World Apart: Bullying in a Middle School Culture

As adolescents have peer-to-peer contacts, the perceptions and lived experiences of healthy inter-personal relationships vary between adults, including parents and educators, and the youths themselves. Relational discrepancy inhibits the development of an appropriate understanding of the parameters of healthy interactions. Current research indicates that youths are susceptible to bullying; therefore, an effort is needed to support bullying prevention strategies as a means of combating inter-personal relationship violence and abuse. Additionally, effective communication is needed to illustrate acceptable behaviors. The issue of bullying will best be examined using an extended literature review and quantitative research. The research – which is a segment of a large, long-term research grant – uses student questionnaires to examine behavior within the students' school culture. This research focused on eleven- to fourteen-year-olds in the 6th, 7th, and 8th grades at Hadley Middle School, a public school in the Midwestern metropolitan city of Wichita, Kansas. Throughout two academic years, students completed questionnaires that asked them to assess respectful behaviors in their school culture. This information will be used to develop tools needed for schools to implement policy changes that equip adolescents entering into inter-personal relationships with a clearer understanding of healthy behaviors.

Emily Rose, William K. White
Faculty Sponsor: George Bousfield
Biological Sciences

Characterization of Recombinant hFSH Glycosylation

Human FSH stimulates ovarian follicle development in females and regulates testicular Sertoli cell function in males. Our laboratory has identified two major hFSH forms differing in glycosylation and binding affinity to FSH receptors. The larger hFSH glycoform possesses all 4 N-glycans (tetra-glycosylated hFSH). The smaller glycoform consists of non-glycosylated FSH β subunit combined with glycosylated α subunit (di-glycosylated hFSH). As FSH glycosylation is essential for FSH receptor activation, this difference in glycosylation could affect activation of intracellular signal pathways. Currently, we express recombinant human FSH in stably transfected GH3 rat anterior pituitary somatotrope cells. The goal of the present study is to compare recombinant hFSH glycosylation with human pituitary-derived FSH glycosylation. FSH preparations immunopurified from conditioned medium and separated into high and low MW fractions by gel filtration were evaluated. Goals included verifying the presence of both glycoforms and defining the nature of the glycan populations decorating each glycoform. Reverse-phase, high performance liquid chromatography carried out on high and low MW recombinant hFSH fractions revealed both fractions possessed mostly the tetra-glycosylated glycoform. Total amino acid and carbohydrate analysis indicated the glycan populations were largely bi-antennary, while human pituitary FSH possesses predominantly tri- and tetra-antennary N-glycans. The smaller recombinant hFSH glycans may explain why the two hFSH β bands in these preparations corresponding to pituitary hFSH 21 and 24 kDa bands migrate faster than those derived from pituitary hFSH.

Ali Sanderson
Faculty Sponsor: Antje Mefferd
Communication Sciences and Disorders

Lower Lip and Jaw Speed Capacity of Young, Middle-Aged, and Older Adults

Although it is well documented that speech and swallowing function decline with age, the underlying reasons are only poorly understood. Motor performance decline has been commonly discussed as a contributing factor; however, studies on orofacial motor capacities are rare. Aging research on limbs has shown movement speed declines with age; however, cranial muscles differ in many ways from skeletal muscles. The limbs may, therefore, not serve as a good model to predict changes in the orofacial system. To address the current knowledge gap, the current study sought to determine aging effects on orofacial motor capacity. This study included 36 participants in the following age groups: 20-27, 45-55, and 65-74. Lower lip and jaw movements were captured using a motion capture system. Reflective markers were placed on the jaw, lower lip, and forehead. All participants completed metronome paced fixed-target tasks, a task specifically designed to experimentally control the duration and excursion of the movements. Metronome paces ranged from 1.4 Hz (slow) to 6.7 Hz (very fast). The 3D Euclidean distance signal between the center lower lip marker or the left jaw marker and the left bottom head marker were used to calculate peak speeds at each metronome pace. Elicited peak speeds were compared across age groups to determine aging effects on speed capacity. Kinematic findings suggested that jaw and lower lip speed capacity does not decline with age. Findings were discussed with regards to limb motor performance in older adults, as well as reported declines in speech production.

Dean Simkins
Faculty Sponsor: Linda Kliment
Aerospace Engineering Department

Using Google Earth to Classify Fire Service Flights through Visual Inspection

Because of several recent catastrophic aircraft structural failures, the United State Forest Service (USFS) and the Federal Aviation Administration have been studying the loads and mission usage of aircraft under the USFS employ. Using flight recorders similar to a “black box” used in commercial aviation, data is gathered, inspected, and digitized for computer analysis. However, some flights’ missions cannot be classified through algorithmic means and it is therefore necessary to examine these files individually for final determination. Previous techniques of visualization required examining the data line by line and plotting two-dimensional graphs. This technique proved time consuming and was often inconclusive in its findings. Using the programming language FORTRAN 77, a computer program was created that takes existing flight data and rapidly synthesizes a movie of the flight that is viewable through the application Google™ Earth. In addition, included features allow the researcher to plot the flight path of the aircraft three dimensionally on the face of the globe in Google™ Earth as well as display pertinent information such as roll, pitch, and yaw throughout the flight. Implementation of the FORTRAN 77 program has been successful by helping classify a previously unknown mission type and significantly speeding up research operations.

Dean Simkins
Faculty Sponsor: Linda Kliment
Aerospace Engineering Department

Obtaining Altitude above Ground for Flight Data Using Google Earth and Python

The United State Forest Service and the Federal Aviation Administration have been interested in the usage and loads experienced during flight of aircraft that are used in firefighting roles. Using flight data recorders similar to a “black box” used in commercial aviation, data is gathered and inspected from the resulting flight files. However, the files only contain altitude above mean sea level whereas Altitude above Ground Level (AGL) would be particularly useful for defining missions, separating flight phases, and categorizing loads that occur throughout flight. By utilizing the programming language Python 2.7, a rapid automated process has been developed to extract the local ground elevation from the aircraft GPS coordinates using Google™ Earth, which is a source of easily accessible and reliable elevation data. To date, a total of 1159 flight files have been successfully processed and now contain AGL data for every second of flight. In addition, preliminary analysis has shown that the use of AGL data has significantly increased the accuracy and capability of analysis through computer algorithms. In the future, the AGL automated processes that were developed will continue to be applied to more flight files from new seasons of firefighting.

Emily Sippel
Faculty Sponsor: Barry Badgett
School of Art and Design- Sculpture

The Answers are hiding within the Parallels of My Questions.

Parallels between my questions appear clearly, but I am always looking for points of intersection.

Being centered in a world of inevitable, continuous change provokes many constant battles not only amongst opposing forces and individuals, but within each of our own complicated, intrapersonal relationships as well. Essentially, we must accept the reality that change is beyond our control. Knowing and understanding what we have to work with, whether it's our internal congeries or tangible objects, allows us to find a solution. By effectively rearranging this information and applying it in novel ways to the aversive situation, we adapt. How much control do we really have? With necessary mental modifications, a sense of control over one's self is the beginning that is rife with possibilities of what outcomes can be created. I create my sculptures as a physical means of experimenting with this understanding. Fortunately, control over the artwork always becomes shared between the medium and me. This enables me to constantly grow and learn by patiently changing through creative problem solving, leading to an improved outcome that is unique and inimitable (the strange goal of every human being.) Using art as a tool for knowledge helps me to draw parallels between the world I create and the world within which I live. I offer one interpretation of these spheres and my views on where humanity stands by navigating the space between these dichotomies in my work. There is no black and white anymore, and finding equilibrium, that middle-point of balance, is a constant process of life. We could dissolve into a world of gray or fall into the middle where true color exists. I choose to be consumed by the latter.

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Analysis and Optimization of Axisymmetric Supersonic Inlets for RBCC Propulsion

Rocket-Based-Combined-Cycle (RBCC) propulsion is an exotic propulsion concept which combines supersonic Ramjet, hypersonic SCRamjet and rocket propulsion into a single, integrated system. The advantage of RBCC propulsion lies in its ability to operate over a wide range of speed regimes - Supersonic to Orbital Velocity - providing both increased propulsive efficiency and versatility for operation in next generation Two-Stage-To-Orbit launch systems. One challenge for successful operation of an RBCC propulsion system begins with proper compression of intake air without sacrificing the energy of the flow used for combustion at large air-breathing Mach numbers (Mach 10 - 15). This is accomplished by operating inlets in optimal configurations which limit total pressure losses and maximize the capture of intake air mass. This study analyzed a wide range of Axisymmetric inlet configurations for Mach numbers ranging from Mach 1 to Mach 15 using a comprehensive MATLAB script which predicts local flow properties and Mach numbers, shock wave locations, shock wave reflection and refraction angles, and flow termination properties. The program determines the inlet mass flow rate of air, total pressure ratio and static pressure and temperature ratios for each inlet configuration-Mach number pairing. The primary goal of this research is to map the optimal flow properties over the air-breathing Mach number range (~ Mach 3 - 15). These values will be used in a secondary study which will analyze the propulsive characteristics and RBCC propulsion systems.

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Analysis of Flight Data from Beechcraft King Airs Used in Aerial Forest Fighting

The United State Forest Service (USFS) and the Federal Aviation Administration have been interested in the mission usage and loads experienced during flight of Beechcraft King Airs that are used in firefighting roles. Through the use of flight recorders, comma separated variable files are created that contain flight data such as aircraft attitude, altitude, and airspeed at one-eighth of a second intervals. Given the large quantity of data contained in thousands of flight files, the process of analysis was automated by writing FORTRAN 77 programs that rapidly process and distill important information that is then used in further research. The programs are currently being implemented and have so far provided worthwhile aggregated findings into the usage and operation of the USFS fleet of King Airs.