CCURI

COMMUNITY COLLEGE UNDERGRADUATE RESEARCH INITIATIVE

Spring 2017 Colloquium

Anoka-Ramsey Community College

April 28, 2017

What we have to learn to do, we learn by doing"

~Aristotle

www.ccuri.org

Dear Colleagues and Friends,

I would like to personally welcome each of you to Minneapolis, MN and the CCURI Regional Conference and Poster Session. The student poster sessions are our signature events where our undergraduate researchers have the opportunity to share their work with the CCURI community. CCURI's mission is to support the development, implementation, and evaluation of undergraduate research programs at our Nation's community colleges. As many of you already know, CCURI is in its second of four years of funding under NSF's Improving Undergraduate STEM Education (IUSE) program. To date, the National Science Foundation has invested more than $5.7M in the CCURI program and its network of community colleges.

In 2014-2015, a total of 6,207 students participated in undergraduate research with support of CCURI at our 44 partner and affiliate institutions. Each year, CCURI sponsors two regional student poster sessions to provide students with an opportunity to showcase their work to the CCURI network. Previous events were held in Philadelphia, Phoenix, Washington, D.C., Charlotte, and Portland. This year, we are honored to be holding our event in the great city of Minneapolis, MN with Anoka-Ramsey Community College as our gracious host.

This Spring, the CCURI Colloquium is being held in conjunction with Anoka-Ramsey Community College's 2nd Annual OSCARS (Outstanding Scholarship, Creative Activities and Research Symposium) event. The OSCARS event will showcase student scholarship at ARCC in multiple disciplines through undergraduate research, project-based learning and creative endeavors.

CCURI believes that the research experience is the most effective way to promote deep learning and advance critical thinking skills, and with close to 50% of our Nation's undergraduates currently pursuing their education at a community college, the CCURI mission is a critical component of this commitment. We hope that you will enjoy exploring the amazing talent on display at this Regional Conference.

Again, welcome to Minneapolis, MN and the CCURI conference. I am glad that you are here, and I look forward to your participation.

Sincerely,

James A. Hewlett
Executive Director
CCURI

KEYNOTE ADDRESS
9:30AM – 10:45AM
LEGACY ROOM

ELLAN F. SPERO, PH.D.

Ellan F. Spero studies the ways that people envision human progress, through the institutions, things, and narratives that they create. A historian of technology, and business, her current research focuses on narratives of progress in academic entrepreneurship, in particular nascent academic-industrial, and international collaborations. She is currently a co-founder and chief curriculum officer for a new non-profit organization that aims to transform and scale postsecondary education through research. She holds a Ph.D. from MIT in History, Anthropology, Science Technology and Society, B.S., M.S. from Cornell in Fiber Science, and M.A. in Museum Studies & Textile History from FIT.

Arizona

Author(s): Nikolaus Abrahamson
Institution: Cochise College
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Author(s): M. Sckaff, R. Myers, N. Massoni, G. Wachtel, M. Buono, M. Montgomery, A. Bowser, J. Riley, E. Priddis
Institution: Cochise College
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California

Author(s): J. Trinidad Varela Arceo
Institution: Los Medanos College
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Author(s): Rebecca Bednorz
Institution: Moreno Valley College
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Author(s): James Corbitt, Joanna Werner-Fraczek
Institution: Moreno Valley College
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Author(s): Luis Cuevas
Institution: Moreno Valley College
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Author(s): Luis Cuevas, Diane Marsh
Institution: Moreno Valley College
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Author(s): Josue Franco, Carolina Sanchez, Juana Pelaez Sanchez, Joanna Werner-Fraczek
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Author(s): Jerome Luigi Cuaresma Ner, Mohammed Wase
Institution: Los Medanos College
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Author(s): Juana Pelaez Sanchez, Carolina Sanchez, Josue Franco, Joanna Werner-Fraczek
Institution: Moreno Valley College
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Author(s): Carolina Sanchez, Juana Pelaez Sanchez, Josue Franco, Joanna Werner-Fraczek
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Colorado

Author(s): Andrew MacErnie, John Starinieri, Wyatt Wiening
Institution: Trinidad State College
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Connecticut

Author(s): Namir Furlow-Jordan, Cleo Rolle, PhD
Institution: Capital Community College
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Delaware

Author(s): Sondra Broomell, John McDowell, Virginia Balke
Institution: Delaware Technical Community College
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Author(s): Jinfeng Gu
Institution: Delaware Technical Community College
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Author(s): Deja L. Latney, Molly C. Williams, John V. McDowell, and Virginia L. Balke
Institution: Delaware Technical Community College
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Hawaii

Author(s): Analisa Mikami
Institution: Kapi'olani Community College
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Author(s): Jonathan Wallen
Institution: Kapi'olani Community College
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Michigan

Author(s): Kaley Johnson, Tyler Schaub
Institution: Muskegon Community College
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Author(s): Lexus Kintgen, Christian Zwit
Institution: Muskegon Community College
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Author(s): Lea Paparella
Institution: Muskegon Community College
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Author(s): Wayne Slone
Institution: Muskegon Community College
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Author(s): Hannah Stephans
Institution: Muskegon Community College
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Author(s): Lauren Thomas
Institution: Muskegon Community College
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Author(s): Aaron VanderWoude, Robin Spielberger
Institution: Muskegon Community College
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Minnesota

Author(s): Pheylan Anderson, Skye Rygh
Institution: Anoka Ramsey Community College
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Author(s): Tyler LaZerte
Institution: Anoka Ramsey Community College
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Author(s): Tyler Leng
Institution: Anoka Ramsey Community College
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Author(s): Vladimir Petrenko
Institution: Anoka Ramsey Community College
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Nevada

Author(s): Jessica McDonald, Kristen Sommerfeld, Laura Briggs
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Author(s): Leah Whitefield, Leonard Naegele, Kimberly Penrose, Summer Strickland, Tina Slowan-Pomeroy, Laura Briggs
Institution: Truckee Meadows Community College
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New Mexico

Author(s): Samuel Johnson, Ryan Pottenger
Institution: Mesalands Community College
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New York

Author(s): Myriah Bodie
Institution: SUNY Broome Community College
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Author(s): Shaina Durand
Institution: Queensborough Community College
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Author(s): Christopher Schmidt
Institution: SUNY Broome Community College
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Author(s): Rawlric Sumner, Sharon Lall-Ramnarine, Tirandai Hemraj-Benny
Institution: Queensborough Community College
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Oklahoma

Author(s): Felipe Plascencia
Institution: Redlands Community College
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Oregon

Author(s): Sahara Strothers
Institution: Portland Community College
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Texas

Author(s): Tara Clancy
Institution: Del Mar College
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Author(s): Wyatt Hooks
Institution: Del Mar College
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Author(s): Josceline Romanielle M. Teñido
Institution: Lone Star College Montgomery
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Washington

Author(s): Arianna Calvin, Bradie Ferguson
Institution: Everett Community College
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Author(s): Cali K.P. Drake[1], Thinh P. Pham[1], Stephani M. Bernard[1], Christopher V. Nguyen, Wei Liao, Nhy Tran, Emma Brasseur, Eunice Jang, Yasmin Dunn, Jonathan A. Miller[1]
Institution: Edmonds Community College
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Oral presentation: Legacy Room 1:00pm

Author(s): Stephani M. Bernard, Cali K.P. Drake, Thinh P. Pham, Wei Liao, Christopher V. Nguyen, Nhy Tran, Emma Brasseur, Hyoseo Jang, Yasmin Dunn, Jonathan A. Miller
Institution: Edmonds Community College
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Author(s): Alena Eldridge
Institution: Everett Community College
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Oral presentation: Legacy Room 1:20pm

Author(s): Thinh P. Pham, Cali K.P. Drake, Stephani M. Bernard, Christopher V. Nguyen, Wei Liao, Nhy Tran, Emma Brasseur, Hyoseo Jang, Yasmin Dunn, Jonathan A. Miller
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STUDENT ORAL PRESENTATIONS
FRIDAY, APRIL 28, 2017
1:00PM – 2:00PM

LEGACY ROOM
MISSISSIPPI ROOM
RIVERVIEW ROOM

Hawaii

CELESTIAL SCREW ANCHOR: AN INVESTIGATION OF APPLIED NEWTONIAN MECHANICS IN MICROGRAVITY

Jonathan Wallen
Kapi'olani Community College
Aaron Hanai (*Faculty Advisor*)

Location: **Riverview Room 1:00pm**

Ever since the discovery of gravitation by Issac Newton, scientists and engineers have used its laws to design the world we operate in today. Our tools, clothing, etc. are all designed to work in Earth's gravity. As man begun to explore space, we have made adaptations to the devices we use on a daily basis. In stellar environments known as micro-gravity, in which the gravity of a specific celestial body is a small fraction of Earth's, certain challenges arise. Such challenge stem from carrying out seemingly simple tasks, like collecting the regolith from the surface of an asteroid, or securely attaching a science tool to a comet. The question becomes, what device will provide the assurance of that an astronaut or expensive scientific equipment will not drift off into space. The answer is found in the design of an anchor that optimizes its own physical attributes to take advantage of all forces that are found in a micro gravity environment. This research applies physical analysis of microgravity systems, standard engineering design processes, and situation equivalent testing to design and produce a functioning anchor for use in celestial micro gravity environments. Upon completion of preliminary analysis, the research continued off the page into prototyping. Through various iterations of shape and size, the final working screw shaped anchor was 3D printed and tested to maintain its anchoring with a 15 pound upward force in Earth's gravity.

Michigan

THE AFFECT OF ZINC ON THE EXPRESSION OF THE FAU GENE IN THE FRESHWATER SPONGE *EPHYDATIA FLUVIATILIS*

Lea Paparella
Muskegon Community College
Darren Mattone (*Faculty Advisor*)
Location: Riverview Room 1:20pm

Endocrine disrupters mimic an organism's naturally synthesized hormones and can potentially stimulate over production of the natural hormone. Along with overstimulation, endocrine disrupters can prevent the natural hormones from binding to receptors. In the sponge *Suberites domunicula*, Fau genes have been shown to have effects of apoptosis, which is an important process required during development and growth. Examing the role of FAU gene expression in the presence of endocrine disruptors could be important for cancer research, as FAU has been shown to be underexpressed in tumor cells and reducing apoptosis. As an endocrine disruptor, zinc has been shown in sponges to stimulate the breakdown ostia. The purpose of this research was to determine the effects of zinc on the expression of Fau gene. Gemmules from the freshwater sponge Ephydatia fluviatilis were hatched in filtered stream water or in various concentrations of zinc nitrate solutions. Growth medium was changed weekly during the four-week trial period. RNA was extracted from the sponges and used in rt-PCR. The cDNA was amplified by PCR with Fau primers. The results of the experiment were inconclusive: gel electrophoresis did not show a DNA band representing the FAU gene. This may be explained by the low concentration of mRNA, improper primers, or the failure of the rt-PCR reaction. Future research would be focused on growing larger quanties of sponges and growing them for short periods of time to produce larger quantities of RNA.

Minnesota

EFFECTS OF WILDFLOWER FIELD MANAGEMENT PRACTICES ON POLLINATING INSECT COUNTS

Pheylan Anderson, Skye Rygh
Anoka Ramsey Community College
Melanie Waite-Altringer (*Faculty Advisor*)
Location: **Riverview Room 1:40pm**

Recently, the United States has seen a prevalent decline in beneficial pollinating insects. Pollinating insects are essential to human and other animal's food supplies and to local ecosystem health. Finding methods to stabilize their population is urgent. This study compared different types of wildflower field management techniques to see if there would be a positive or negative effect on the amount of pollinating insects visiting the field. The central question was: Will different field management techniques affect the growth of wildflowers and pollinating insect counts? The prediction is: if the management techniques affected wildflower growth, then the highest density of wildflowers and pollinating insects would be seen in the disked and seeded plots, due to faster nutrient recycling, elimination of shade, and a higher seed density. Pollinating insects and flower density were recorded on each plot once a week throughout the 2016 summer flowering season at a 25 acre demonstration plot located on the Cambridge campus of Anoka Ramsey Community College (ARCC). Insects were counted by observers walking each plot for two minutes. Data analysis showed that Plot B, the disked and unseeded section, had the highest insect counts throughout the season. Plot B likely supported plants that attracted pollinators for longer periods, and in greater numbers, than the other plots did. The results suggest that simply lightly disking a large wildflower plot is the best method for attracting pollinators, and does not have as great an effect on flower density.

Oklahoma

WORM POPULATIONS PREDICT SOIL HEALTH
Felipe Plascencia
Redlands Community College
Dee McKenna (*Faculty Advisor*)
Location: **Mississippi Room 1:00pm**

The purpose of this study conducted at Redlands Royse Ranch Living Laboratory is to determine if worm population can be used as an indicator of soil health. Soil health is important for increased production of agricultural land; therefore, more food is available to humans as well as livestock. An environmental benefit of healthy soil is less runoff which leads to less soil erosion and more organic material available for crop production. In this 32 acre study, five plots were randomly sampled; 6 acre conventional-tilled non-grazed, 5 acre no-tilled grazed, 5 acre no-tilled non-grazed, 10 acre no-tilled *Sure Crop* non-grazed, 6 acre control. In each plot, samples were collected from the center and four areas randomly selected by tossing a 27 cm Frisbee. Soil moisture and soil temperature were recorded prior to excavation and count of worm and wormholes. This study found more wormholes than worms with an overall increase in the worm population from the previous semester. In conclusion, the worm population is on the rise, more so with the no-tilled plots than the conventional-tilled. The increase in the worm population may be due to the increase in soil temperature, in comparison with the previous semester. Due to increasing worm populations, additional data will be collected including soil pH and fertility using the *Rapitest* probe. Expansion of soil health parameters will benefit other research conducted at Redlands Community College, the Southern Plains Climate Hub and the Natural Resource Conservation Service.

Texas

A DEVELOPMENT OF AN *IN VITRO* MODEL OF BACTERIAL EVOLUTION OF DRUG RESISTANCE

Josceline Romanielle M. Teñido
Lone Star College Montgomery
Julie Harless (*Faculty Advisor*)
Location: **Mississippi Room 1:20pm**

Bacterial evolution of resistance to antibiotics was evident from early studies of bacterial genetics; and this resistance was quickly seen in patient samples in the 1950s. Over time, as patients incorrectly take their antibiotics, resistant bacteria become the majority population. To simulate the development of drug resistance *in vivo*, an *in vitro* method was developed. Previous works have approached the study of evolution of resistance either *in vivo* in clinically relevant doses or *in vitro* with extremely low concentrations of antibiotics. These *in vitro* studies failed to address the effects of antibiotics at clinically relevant doses. In my experiments, bacteria were exposed to the concentrations of antibiotic just below minimal inhibitory concentration (MIC) to select for mutant organisms. In addition, an ultraviolet spectrophotometer was used to determine growth curves of bacteria in different concentrations. The bacteria repeatedly exposed to lower concentrations eventually developed very high resistance to antibiotics, which models a patient incorrectly taking antibiotic. The results are compared with acute exposure to clinically appropriate doses.

Washington

EFFICACY AND PROOF OF PRINCIPLE OF AN ATMOSPHERIC PRESSURE PLASMA JET FOR SPACECRAFT STERILIZATION FOR NASA

Cali Drake, Thinh Pham, Stephani Bernard, Christopher Nguyen, Wei Liao, Nhy Tran, Emma Brasseur, Eunice Jang, Yasmin Dunn, Jonathan A. Miller
Edmonds Community College
Jonathan A. Miller (*Faculty Advisor*)
Location: **Legacy Room 1:00pm**

NASA confronts a forward contamination problem with the launch of spacecraft into extraterrestrial environments for potential detection of life. Earth-origin microbes risk threatening planetary systems, compromising the data obtained, and require implementing microbial control for planetary protection from cross contamination. While generally effective, currently approved decontamination methods are costly, involve high heat and chemical treatments, and risk damaging thermally sensitive spacecraft materials and components. Alternative methods, including atmospheric pressure plasma jets (APPJs), show promise as effective technologies for microbial control. Researchers at Edmonds Community College partnered with Eagle Harbor Technologies (EHT) of Seattle, WA to test the capabilities of an APPJ developed by EHT. *Bacillus atrophaeus* endospores were spread on tryptic soy agar plates to test 910 combinations of parameters allowing independent, unprecedented control over pulse width, frequency, voltage, distance, electrode placement, jet configuration, gas composition, and flow rate. Two promising combinations were chosen to calculate a D-value averaging 160 seconds on aluminum, demonstrate greater than 99% killing for hard-to-reach areas through elevated and tapered holes, and identify optimal conditions involving humidity and low concentrations of O_2 yielding greater than 4-log reduction in endospores. Proof of principle approaches of an APPJ as a "brush" over 56.75 cm² for 10-minutes yielded greater than 6-log reduction, showing potential efficacy of a multi-jet array for large-area microbial reduction. Further characterization of increased voltage and frequency with variable pulse width, humidity, and low O_2 could lead to improved efficacy with decreased exposure time and allow for development of an APPJ optimized for spacecraft sterilization.

SEASONAL VARIATION OF NORTH AMERICAN RIVER OTTER (LONTRA CANADENSIS) PREDATION ON LOCAL FISH SPECIES

Alena Eldridge
Everett Community College
Robin Araniva, Ardi Kveven (*Faculty Advisors*)
Location: **Legacy Room 1:20pm**

Lontra canadensis, or the North American river otter, is a member of the mustelid family residing in estuarine and riparian environments such as the Snohomish River estuary system in Everett, WA. Ocean Research College Academy (ORCA) collected *L. canadensis* scat samples near the Port of Everett for dissection and seasonal diet analysis. Past research found that the diet of *L. canadensis* is comprised of fish, crustacean, and avian prey at the mouth of the Snohomish River. Current research to identify prey species in the scat are now underway with the extraction of bony parts for genetic analysis at Shoreline Community College. Camera traps were set and monitored using motion sensors at known latrine sites and surface temperature were monitored monthly using a YSI probe. Preliminary genetic results identified *Oncorhynchus gorbuscha,* or pink salmon, during the fall of 2013, demonstrating opportunistic predation on available salmon species during the biennial migration. Further questions being explored include a correlation with increased consumption of faster swimming fish during colder seasons or with larger groups gathering at latrine sites. Characterization of seasonal, interannual, and social factors affecting the diet of *L. canadensis* can raise awareness of other environmental stressors in the ecosystem, such as fish population changes and changes in prey availability.

STUDENT POSTER PRESENTATIONS
FRIDAY, APRIL 28, 2017
2:00PM – 4:00PM
LEGACY ROOM

Arizona

MICROBIOTA OF THE GRASSLANDS AND RIPARIAN AREA OF THE SONORAN DESERT
Nikolaus Abrahamson
Cochise College
Kari Durham (*Faculty Advisor*)
Display area: **1**

THE EFFECT OF HUMAN PRESENCE ON WILDLIFE ACTIVITY ALONG THE ARIZONAN U.S.-MEXICO BORDER
M. Sckaff, R. Myers, N. Massoni, G. Wachtel, M. Buono, M. Montgomery, A. Bowser, J. Riley, E. Priddis
Cochise College
Edmund Priddis (*Faculty Advisor*)
Display area: **2**

Southeastern Arizona is one of the most biodiverse areas in the United States of America and perhaps even all of North America. This is due to its unique position at the convergence of four major deserts and the presence of mountain ranges scattered throughout the semi-arid landscape called “sky islands.” The uniqueness of this area is increased, as the region sits on the border between two countries. Many of the species found in this area are at the northernmost reach of their range. Within this region are a number of waterways that transverse the border and may act as an important corridor for species movements. This study compares the activity of species “captured” at three sites on federal conservation lands, that lie within the border region, to the human activity also “captured” in these locations. High output covert infrared detecting camera traps were deployed at each of the sites. Pictures were gathered from March 2015 through December 2016. The relative abundance of species at each location, seasonal variations in species’ abundance, and species pair activity similarity were examined. The results indicated that there has been no distinctive correlation between human activity and wildlife transit in the locations studied. Future studies will include placing camera traps on the Mexican side of the border. Pictures and scat will be analyzed to determine the effect of the Arizonan U.S.-Mexico border on animal migration patterns and microevolution of wildlife species.

California

KINETICS WITH A FOCUS ON IODINE
J. Trinidad Varela Arceo
Los Medanos College
Melinda Capes (*Faculty Advisor*)
Display area: **3**

The ability to control the speed or rate of a chemical reaction is of interest when studying a chemical reaction. The experimenter may desire to increase the rate of the reaction and knowing the kinetics of the reaction is vital to this. The goal of our experiment was to determine the rate law for the reaction of acetone and iodine in the presence of an acid catalyst: (CH3)2CO(aq) + I2(aq) → ICH2COCH3 + HI(aq). Our experimentally determined rate law is Rate = 0.25M-1S-1[I2]0[acetone]1[H+]1 . We determined the rate law by determining the order of our reactants using spectrophotometry. After we determined the order of our reactants we calculated the rate for our reactions and used this to help us calculate the rate of the overall reaction. Our overall reaction order is two, which means if we increase double our concentration of either reactant, our reaction rate doubles.

COMPARING THE RATIO OF TRANSCRIPTION AND TRANSLATION USING TRAP
Rebecca Bednorz
Moreno Valley College
Joanna Werner-Fraczek (*Faculty Advisor*)
Display area: **4**

Every living organism is made up of proteins determined by their genetic makeup. Proteins are made by transcribing DNA into mRNA followed by translation in ribosomes. If an organism has a defective or absent protein, an array of chronic and/or deadly diseases may result. Protein synthesis is controlled by multiple mechanisms. One such mechanism, translation regulation, determines which mRNA is translated and which is discarded. This study focuses on the relationship between transcribed mRNA in comparison to the amount of translated mRNA using a method called TRAP (Translating Ribosome Affinity Purification). By adding a tag to a ribosomal protein involved in translation, we are able to monitor the amount of mRNA being translated at a point in time. In this study, we are following flagged ribosomes in the model plant, *Arabidopsis thaliana*. The TRAP method provides insight into how an organism can regulate protein synthesis. Once the regulation is understood, the modification of the default protein synthesis could be halted, and the development of a disease could be stopped.

ANALYSIS OF CLIFF SWALLOW'S DIET AND ECOPARASITES IN NESTS

James Corbitt
Moreno Valley College
Joanna Werner-Fraczek (*Faculty Advisor*)
Display area: **5**

Moreno Valley College (MVC) is a seasonal home to migratory birds, Cliff Swallows (Petrochelidon pyrrhonota), that build their nests on campus buildings. Cliff swallows are insectivores that consume thousands of insects a day. The analysis of the swallow's diet considering their predatory nature will help to assess the role of swallows as natural regulators of the insect population. This study report on insect species found in the stomach of swallows, flying insects present on the MVC campus, as well as ecoparasites found in the nests. DNA barcoding was the selected method to identify insects via bioinformatics tools. Twenty-four insect species were identified from the insects captured on the MVC campus. Eight insect species were found in the collected nests. Future quantitative studies will address the correlation between the presence of swallows and the insect population at MVC.

FLYING WITH THE SWALLOWS: HOW HEALTHY IS THE WATER AND DIRT THEY USE?

Luis Cuevas
Moreno Valley College
Diane Marsh (*Faculty Advisor*)
Display area: **6**

Of all the places in the world, Moreno Valley College has the privilege of seeing the beautiful Cliff Swallows nest as they migrate from places as far as South America. It is necessary to study the soil they use for their nests, and the sprinkler water that they usually drink to help determine if the area supports a healthy environment for these Cliff Swallows and to see why they decide to choose the college for the nesting grounds. The purpose of these experiments is to collect data to find correlations and it serves well for preparing students for research too. We tested the water and soil for the concentration of Iron (III) ions using the equilibrium equation: $Fe^{3+}(aq) + SCN^{-}(aq) \Leftrightarrow FeSCN^{2+}(aq)$ in 0.050M(HNO_3). Our chemistry 1AH class did this using Colorimetry and making a Beer's Law Plot to find the Iron ion concentration. For Chemistry 1BH, we tested the soil and water for the same thing, but this time using the equilibrium constant Kc (found in a previous controlled experiment) and by Initial, Change, and Equilibrium (I.C.E) charts. Soon, we'll be able to determine the impact it has on their health so we can make improvements or continue keeping a watchful eye. The Cliff Swallows seem to be coming later and later every year so we're also trying to see if the dirt and sprinkler water have something to do with it.

A FIELD TEST METHOD FOR DETERMINATION OF IODIDE ION CONCENTRATION USING AN IODINE METHOD
Luis Cuevas, Diane Marsh
Moreno Valley College
Diane Marsh (*Faculty Advisor*)
Display area: **7**

MONITORING FLYING INSECT THAT CAN BE POTENTIAL FOOD FOR CLIFF SWALLOWS AT THE MORENO VALLEY COLLEGE IN SOUTHERN CALIFORNIA
Josue Franco, Carolina Sanchez, Juana Pelaez Sanchez, Joanna Werner-Fraczek
Moreno Valley College
Joanna Werner-Fraczek (*Faculty Advisor*)
Display area: **8**

During the springtime at Moreno Valley College campus in Southern California, cliff swallows migrate to our campus to mate and nest in the corners of campus buildings. The cliff swallows consume insects natural to Moreno Valley including yellow jackets, whiteflies and domestic flies, as found from previous research. While this information is useful to know the relationship between the swallows and control the population of insect pest, the focus of this study is to investigate all flying insects (native and invasive) that live around our campus. Insects are collected year-round using insect traps distributed around the campus. Individual insect species are identified using cytochrome oxidase 1 primers and DNA barcoding technique. Future study will analyze biology of these insects and their impact on ecosystem diversity around Moreno Valley College.

KINETIC FACTORS OF HYDROGEN PEROXIDE DECOMPOSITION CATALYZED BY POTASSIUM IODIDE
Jerome Luigi Cuaresma Ner, Mohammed Wase
Los Medanos College
Melinda Capes (*Faculty Advisor*)
Display area: **9**

THE CLIFF SWALLOW POPULATION AT MORENO VALLEY COLLEGE – THE RESULTS OF FOUR-YEAR MONITORING

Juana Pelaez Sanchez, Carolina Sanchez, Josue Franco, Joanna Werner-Fraczek
Moreno Valley College
Joanna Werner-Fraczek (*Faculty Advisor*)
Display area: **10**

The American cliff swallow, Petrochelidon pyrrhonota is a migratory bird that flies to North America for its breeding season in the spring. Every year the cliff swallow reaches its destination at Moreno Valley College (MVC). They integrate themselves well in the valley's ecosystem, using resources from our region to build their nests, and interact symbiotically with dessert species of plants and animals found in our campus. The impact of the cliff swallow's migration has given rise to many research opportunities at the undergraduate level including monitoring and analyzing the nesting population using mapping software. In order to monitor nest development throughout the campus, research students use ESRI's ArcGIS a geographic information software which maps the location of nests. In 2014, 47 completed nests were recorded; while in 2015, the number of completed nests was 88. Currently, nests from 2016 were collected and will be analyzed for mud differentiation, nest measurements, and identification of insects found inhabiting the nests. Ongoing research has prompted MVC towards building an alternative nesting structure to allow for further monitoring of the cliff swallow population.

ANALYSIS OF CLIFF SWALLOW DIET USING INSECT GENUS SPECIFIC PRIMERS

Carolina Sanchez, Juana Pelaez Sanchez, Josue Franco, Joanna Werner-Fraczek
Moreno Valley College
Joanna Werner-Fraczek (*Faculty Advisor*)
Display area: **11**

Moreno Valley College in Southern California is the site of nesting for cliff swallows throughout spring and have become an integral part of the community on campus since 2015. Cliff swallows are insectivores that are feeding on insects flying in swarms. Little is known about the cliff swallows' diet around our college as well as their impact on insects' diversity. This study report demonstrates a new approach to identify insects by DNA analyses found in birds' droppings. Droppings will be collected on a daily basis throughout the nesting season in different locations around the campus. DNA will be isolated and amplified using genus specific primers for insects known to be consumed by swallows or insects found on the campus, based on a previous study. This project will be completed with the involvement of students conducting individual research as well as students enrolled in two biology major courses. The findings will not only address questions regarding swallow diet and insect diversity, but also help to define the beneficial role of swallows in the elimination of insects potentially hazardous to humans.

Colorado

DIGESTIVE FITNESS PARAMETERS OF THE HOUSE FLY
Andrew MacErnie, John Starinieri, Wyatt Wiening
Trinidad State College
Cliff Wiening (*Faculty Advisor*)
Display area: 12

The effects of three different sugar diets were studied on one selected fitness parameter on the house fly Musca domestica (L.) was examined. Six identical cages, two for each sugar source was established with flies from the same population. As flies enclosed they were fed one of three different sugars, monosaccharide, an oligosaccharide and a synthetic sweetener. Mortality rates were recorded daily. Flies that were fed a synthetic source were the first to die off with the oligosaccharide being the second and the monosaccharide had the lowest mortality rates.

Connecticut

GENE ANNOTATION OF THE F ELEMENT OF *DROSOPHILA FICUSPHILA*
Namir Furlow-Jordan, Cleo Rolle, PhD
Capital Community College
Cleo Rolle, PhD (*Faculty Advisor*)
Display area: **13**

An overarching goal of the Genomics Education Partnership (GEP) at Washington University in St. Louis is to collaborate with faculty at primarily undergraduate institutions to engage students in gene annotation research to identify regulatory motifs from the F element of related *Drosophila* species. We annotated a 45kb region of the F element from *Drosophila ficusphila*. Initially, using the UCSC Genome Browser mirror to view blastx data, we identified key genetic features and sequence similarity of *D. ficusphila* against *D. melanogaster*. Putative orthologs were identified based on blastp searches against annotated *D. melanogaster* proteins. Next, we evaluated N-SCAN and GenScan predictions using blastx to assign preliminary coding region boundaries along our contig. TopHat predictions were used to verify phases of donor and acceptor sites. Finally, we evaluated our gene model coordinates using the Gene Model Checker to determine whether our proposed model satisfied basic biological constraints, such as start codons, stop codons and compatible splice sites. Our hope is that our findings will contribute to data that shed light on the mechanisms underlying gene expression from heterochromatin. We acknowledge the GEP for providing the genome browser assembly and related teaching materials; GEP is supported by the NSF IUSE Grant #1431407.

Delaware

CLONING AND PURIFICATION OF ENDOGLUCANASES FROM *BACILLUS SUBTILIS* AND *STREPTOMYCES SP. A11A*
Sondra Broomell, John McDowell, Virginia Balke
Delaware Technical Community College
Virginia Balke (*Faculty Advisor*)
Display area: **14**

With growing interest in alternative energy sources, cellulase enzymes are increasingly investigated for converting cellulose to glucose for the synthesis of ethanol, an alternative biofuel. Much of the research performed has focused on fungal cellulases, however, researchers are increasingly studying bacterial cellulases. Typically, three differing cellulase enzymes work synergistically to hydrolyze cellulose to glucose. Endocellulases randomly cleave internal cellulose bonds, exocellulases cleave the bonds two units from the ends of the cellulose polymer, while beta-glucosidases cleave cellobiose into glucose. Endoglucanase genes were cloned from two bacterial species shown to be cellulase positive through plate assays. Primers were designed from the literature to amplify the endoglucanase gene from *Bacillus subtilis*. An environmental isolate, *Streptomyces sp. A11a* had its full genome sequenced and annotated using RAST. Primers were designed for an endoglucanase genes from *Streptomyces sp. A11a*. Amplicons were successfully cloned into pET 160/GW/D-TOPO expression vector. The expressed proteins were purified by IMAC. Future studies will be done to characterize the temperature and pH profiles of these enzymes.

V2G COST AND BENEFIT ANALYSIS IN THE HOSPITAL
Jinfeng Gu
Delaware Technical Community College
Cory Budischak (*Faculty Advisor*)
Display area: **15**

BINDING STUDIES OF THE CRA (FRUR) OF *PSEUDOMONAS FLUORESCENS* SP. BW6L

Deja L. Latney, Molly C. Williams, John V. McDowell, and Virginia L. Balke
Delaware Technical Community College
Virginia Balke (*Faculty Advisor*)
Display area: **16**

Cra (FruR) is a fructose utilization regulator in Gram-negative bacteria. In E. coli, which preferentially uses glucose as a carbon source, EcCra plays a role as activator/repressor protein for several metabolic operons. In Pseudomonas putida, which does not preferentially use glucose, PpCra was shown to repress the fructose utilization operon and its effector molecule is fructose-1-phosphate. The differences between these two bacteria likely reflect their differing natural niches. To further investigate the role of Cra in Pseudomonas, we cloned the cra gene from P. fluorescens BW6L and a putative binding sequence. Electrophoretic mobility shift assays (EMSA) indicated that PfCra binds to the identified sequence. Online tools were used to identify additional putative PfCra binding sites in P. fluorescens BW6L. EMSA is being performed on the additional binding sequences to investigate the potential role of PfCra in regulating expression of these genes. We are also testing the ability of fructose-1-phosphate and other fructose derivatives in releasing PfCra from its binding sites. These experiments will further our understanding of Cra regulation on metabolic pathways in Pseudomonas fluorescens.

Hawaii

CREATING ANTIGENS AND GENERATING MONOCLONAL ANTIBODIES AGAINST VIRULENCE FACTORS OF *CAMPYLOBACTER JEJUNI*

Analisa Mikami
Kapi'olani Community College
Matthew Tuthill, John Berestecky (*Faculty Advisors*)
Display area: **17**

Campylobacter jejuni is commonly found on poultry products, and a leading cause of human gastroenteritis. While infection by this bacterium is typically self-limiting, in rare cases it correlates with a autoimmune disorder called Guillain-Barre Syndrome. To date, the identity and function of many of the genes are not known, and the mechanisms responsible for the attachment and invasion of this germ within the human intestine are not well understood. Similarly, adequate molecular tools to investigate the interaction between the bacterium and the human host are very limited. Because of this, Kapiolani Community College is in the process of producing proteins that have been published as putative virulence factors of *Campylobacter*, such as PEB1. This is accomplished by cloning and expressing *Campylobacter* genes from a HaloTag plasmid in *Escherichia coli*. Once purified, these proteins then serve as antigens in the immunization of mice in order to generate antibody-producing hybridoma cells. Antibody products are then assayed for specificity to *Campylobacter* proteins using immunoblotting and ELISA methods. Upon successful production of antibodies against *Campylobacter* proteins, these antibodies can then be used to query the presence of various virulence factors in different strains of the bacteria. Moreover, these antibodies will also be used to antagonize the interaction of bacterial adhesins, and potentially decrease the attachment and invasion of human cells by *Campylobacter*. And finally, production of additional antibodies against *Campylobacter* will allow researchers to better determine steps, proteins, and mechanisms involved in gastroenteritis, which could potentially lead to vaccine development.

CELESTIAL SCREW ANCHOR: AN INVESTIGATION OF APPLIED NEWTONIAN MECHANICS IN MICROGRAVITY

Jonathan Wallen
Kapi'olani Community College
Aaron Hanai (*Faculty Advisor*)
Display area: **18**

Ever since the discovery of gravitation by Issac Newton, scientists and engineers have used its laws to design the world we operate in today. Our tools, clothing, etc. are all designed to work in Earth's gravity. As man begun to explore space, we have made adaptations to the devices we use on a daily basis. In stellar environments known as micro-gravity, in which the gravity of a specific celestial body is a small fraction of Earth's, certain challenges arise. Such challenge stem from carrying out seemingly simple tasks, like collecting the regolith from the surface of an asteroid, or securely attaching a science tool to a comet. The question becomes, what device will provide the assurance of that an astronaut or expensive scientific equipment will not drift off into space. The answer is found in the design of an anchor that optimizes its own physical attributes to take advantage of all forces that are found in a micro gravity environment. This research applies physical analysis of microgravity systems, standard engineering design processes, and situation equivalent testing to design and produce a functioning anchor for use in celestial micro gravity environments. Upon completion of preliminary analysis, the research continued off the page into prototyping. Through various iterations of shape and size, the final working screw shaped anchor was 3D printed and tested to maintain its anchoring with a 15 pound upward force in Earth's gravity.

Michigan

FRESHWATER SPONGE DENSITY AND DIVERSITY IN THE ROGUE WATERSHED (GRANT, MI)
Kaley Johnson, Tyler Schaub
Muskegon Community College
Darren Mattone (*Faculty Advisor*)
Display area: **19**

Sponges are an ancient group of organisms that are found in both marine and freshwater environments. Compared to marine sponges, the types of freshwater sponges, their locations, and the environmental conditions in which they grow are not well known. When found, their similar physical characteristics make many freshwater sponges difficult to differentiate from one another. This study examined the diversity and density of freshwater sponges found in a small section of the Rogue River watershed in Grant, Michigan, along with the environmental conditions in which the sponges were found. Transects and quadrats used to systematically sample sponges *in situ.* DNA barcoding was used to determine genus and species. Barcoding data indicated that 89% (n=17) of the samples were *Ephydatia meülleri*, and 11% (n=2) were *Ephydatia fluviatilis*. These data are important as *Ephydatia meülleri* has not been found by local researchers in the stream and river environments around West Michigan (compared to many instances of *Ephydatia fluviatilis.* Local population of *Ephydatia meülleri* can now be used in gene expression, evolutionary, and gemmule hatching studies and compared with the local populations of the *Ephydatia fluviatilis*. In addition, transcriptomes and other genetic data are available for *Ephydatia meülleri* studies, but are limited for *Ephydatia fluviatilis*.

AN ANALYSIS OF SALIVARY CORTISOL LEVELS IN RESPONSE TO THE ACADEMIC STRESS OF COMMUNITY COLLEGE STUDENTS
Lexus Kintgen, Christian Zwit
Muskegon Community College
Darren Mattone (*Faculty Advisor*)
Display area: **20**

Nearly 50% of university students have indicated overwhelming anxiety, with nearly one-third reporting life hindering depression. While many studies have quantified student stress at 4-year schools, very few have examined stress in 2-year, community college students. This research attempted to quantify the stress associated with college exams at Muskegon Community College (Muskegon, MI) by measuring salivary cortisol levels. Subjects submitted saliva samples and self-reported stress inventories one week prior to taking an exam, within two hours of the exam, and one week following the exam. Salivary cortical levels were measured using the Salimetrics Salivary Cortisol ELISA kit and data correlated with the stress inventories. It was to be expected that a student's stress would peak when they had an upcoming exam. Subjects' stress levels, however, were likely dependent on many other outside factors, leading to the suggestion that community college student's stress is less revolved around academics and more revolved around personal stress factors.

THE AFFECT OF ZINC ON THE EXPRESSION OF THE FAU GENE IN THE FRESHWATER SPONGE *EPHYDATIA FLUVIATILIS*

Lea Paparella
Muskegon Community College
Darren Mattone (*Faculty Advisor*)
Display area: **21**

Endocrine disrupters mimic an organism's naturally synthesized hormones and can potentially stimulate over production of the natural hormone. Along with overstimulation, endocrine disrupters can prevent the natural hormones from binding to receptors. In the sponge *Suberites domunicula*, Fau genes have been shown to have effects of apoptosis, which is an important process required during development and growth. Examing the role of FAU gene expression in the presence of endocrine disruptors could be important for cancer research, as FAU has been shown to be underexpressed in tumor cells and reducing apoptosis. As an endocrine disruptor, zinc has been shown in sponges to stimulate the breakdown ostia. The purpose of this research was to determine the effects of zinc on the expression of Fau gene. Gemmules from the freshwater sponge Ephydatia fluviatilis were hatched in filtered stream water or in various concentrations of zinc nitrate solutions. Growth medium was changed weekly during the four-week trial period. RNA was extracted from the sponges and used in rt-PCR. The cDNA was amplified by PCR with Fau primers. The results of the experiment were inconclusive: gel electrophoresis did not show a DNA band representing the FAU gene. This may be explained by the low concentration of mRNA, improper primers, or the failure of the rt-PCR reaction. Future research would be focused on growing larger quanties of sponges and growing them for short periods of time to produce larger quantities of RNA.

MODELING THE RESISTANCE OF *STREPTOCOCCUS PYOGENES* TO CLINICAL CONCENTRATIONS OF AMPICILLIN

Wayne Slone
Muskegon Community College
Darren Mattone (*Faculty Advisor*)
Display area: **22**

Streptococcus pyogenes is gram positive bacterium that causes a variety of respiratory tract infections. Found in 10-15% of healthy children as part of their normal microbiota, *Streptococcus pyogenes* infections have become harder to treat, with up to 35% of patients failing to respond to with penicillin treatment. While *strep* infections can go away on their own, antibiotics do reduce the duration of symptoms. Because resistance to antibiotics is increasing, should the infection be left to run its course rather than treat with antibiotics? The objectives of this study were to measure the level of antibiotic effectiveness against *Streptococcus pyrogenes*, and measure the resistance of surviving bacterium. *Streptococcus pyogenes* was cultured in standard nutrient broth for 72 hours while growth rates were observed using spectrophotometry. Following culturing, clinical doses of ampicillin (62.5 mg/ml and 96.2 mg/ml, respectively) were introduced to the cultures and growth rates were observed. A Kirby Bauer test was conducted at initial inoculation and after 72 hours of antibiotic treatment in nutrient broth. Data indicated a decrease in zones of inhibition of 29% at 62.5 mg/ml and 95% at 96.2 mg/ml. This study indicates that antibiotics were unsuccessful in eradicating the surviving bacterium, and that resistance to ampicillin developed after 1 treatment. More research must be conducted to evaluate the correlation between risk and benefits of antibiotic use for *Streptococcus pyogenes*.

SDSILIC*ABGE* GENE EXPRESSION IN EPHYDATIA FLUVIATILIS GROWN IN HIGH SILICA MEDIUM

Hannah Stephans
Muskegon Community College
Darren Mattone (*Faculty Advisor*)
Display area: **23**

THE EFFECTS OF GLYPHOSATE-BASED HERBICIDE ON THE MORPHOLOGY OF DEVELOPING *EPHYDATIA FLUVIATILIS* HATCHLINGS

Lauren Thomas
Muskegon Community College
Darren Mattone (*Faculty Advisor*)
Display area: **24**

Glyphosate-based herbicide has become one of the most widely used agricultural chemicals on the planet and has been shown to have negative physical effects on a variety of vertebrate organisms. As one of the oldest groups of organism on earth, sponges can be used as model organisms for studying developmental pathways. Because many developmental pathways in sponges have analogs in other organisms, it is possible to study sponge development under certain conditions to hypothesize how other organisms might be affected. This study examined the effects of glyphosate-based herbicide on gemmule hatching and adult *Ephydatia fluviatilis* freshwater sponges. Gemmules were placed in vaying concentrations of glyphosate to monitor hatching rates; normal growth medium was replaced with dilute glyphosate solution for adult sponges. Gemmules placed in glyphosate did not hatch, but previously grown adult sponges placed in glyphosate solution showed changes in oscula and choanocyte chamber morphology. Based on these data, future research would focus on examining in more detail the size of chaoancyte chambers, oscula, and pumping rates of adult sponges after being placed in varying concentration of glyphosate solutions.

USING THE FRESHWATER SPONGE EPHYDATIA FLUCIATILIS AS A SOURCE OF ANTIBIOTICS: METABOLITE EXTRACTION METHODS AND THE DEGREE OF ANTIBIOTIC POTENTIAL

Aaron VanderWoude, Robin Spielberger
Muskegon Community College
Darren Mattone (*Faculty Advisor*)
Display area: **25**

Overuse of antibiotics has led to an increase in the number of superbugs that threaten human health. New sources of antibiotic and bioactive chemicals need to be identified, which may exhibit antibiotic properties. Freshwater and marine sponges host diverse microbial communities and produce unique molecules that could be a source of new antibiotics and bioactive compounds. To determine the if the freshwater sponge *Ephydatia fluviatilis* produces antibiotic compounds, a variety of solvents (methanol, chloroform, ethanol, and butanol) were used to extract chemicals from the sponge tissue. The extracted chemicals were tested against *Escherichia coli* grown on nutrient agar. Sterile paper discs were soaked in the solvent/extract solutions and placed on nutrient agar plates streaked with *E. coli.* Final results were inconclusive as the discs for each of the extraction solvents showed no zones of inhibition on the agar plates. Lack of antibiotic potential may have resulted from a low concentration of biochemical in the extracts, or the extraction process rendered antibiotic chemicals ineffective against bacteria. Future experiments might be to test these chemicals against additional bacterial organisms, or concentrate the extracted molecules via solvent evaporation as perhaps there was not enough of the molecules on the discs.

Minnesota

EFFECTS OF WILDFLOWER FIELD MANAGEMENT PRACTICES ON POLLINATING INSECT COUNTS

Pheylan Anderson, Skye Rygh
Anoka Ramsey Community College
Melanie Waite-Altringer (*Faculty Advisor*)
Display area: **26**

Recently, the United States has seen a prevalent decline in beneficial pollinating insects. Pollinating insects are essential to human and other animal's food supplies and to local ecosystem health. Finding methods to stabilize their population is urgent. This study compared different types of wildflower field management techniques to see if there would be a positive or negative effect on the amount of pollinating insects visiting the field. The central question was: Will different field management techniques affect the growth of wildflowers and pollinating insect counts? The prediction is: if the management techniques affected wildflower growth, then the highest density of wildflowers and pollinating insects would be seen in the disked and seeded plots, due to faster nutrient recycling, elimination of shade, and a higher seed density. Pollinating insects and flower density were recorded on each plot once a week throughout the 2016 summer flowering season at a 25 acre demonstration plot located on the Cambridge campus of Anoka Ramsey Community College (ARCC). Insects were counted by observers walking each plot for two minutes. Data analysis showed that Plot B, the disked and unseeded section, had the highest insect counts throughout the season. Plot B likely supported plants that attracted pollinators for longer periods, and in greater numbers, than the other plots did. The results suggest that simply lightly disking a large wildflower plot is the best method for attracting pollinators, and does not have as great an effect on flower density.

PRELIMINARY MAMMAL SURVEY USING CAMERA TRAPS IN THE ANOKA-RAMSEY COMMUNITY COLLEGE NATURAL AREA

Tyler LaZerte
Anoka Ramsey Community College
Jennifer Braido (*Faculty Advisor*)
Display area: **27**

The Coon Rapids campus of Anoka-Ramsey Community College is fortunate to have approximately 26 acres of preserved natural habitat available as an outdoor laboratory. The purpose of our investigation was to perform a preliminary assessment of the mammal species found within this natural area. Multiple species have been noted anecdotally but no data have actually been recorded, tracked or analyzed in the 50 years the college has been on the grounds. Our study location is comprised of an oak woodland, a former farm field in various stages of succession, an oak savanna, and a 5-acre restored prairie area nestled along the banks of the Mississippi River. Based on anecdotes from current and former faculty as well as the features offered by these habitat types we hypothesized we would find species such as white-footed mice, eastern gray squirrel, eastern cottontail, red fox, and raccoon. Cameras were deployed at various locations within this area during the fall 2015 and 2016 semesters. 90 trap-nights yielded 219 captures total. Thirteen mammal species were photographed with eastern gray squirrels being the most frequently captured species. Future studies of this natural area will seek to confirm resident species capable of coping with high recreation use and landscape fragmentation as well as document transient species utilizing the natural area as a wildlife corridor to other nearby protected areas.

OPTIMIZATION OF A BF3 CATALYZED BIODIESEL REACTION AND MALDI-TOF MASS SPECTOMETRY ANALYSIS OF A LIPID FEEDSTOCK

Tyler Leng
Anoka Ramsey Community College
Patricia Pieper, PhD (*Faculty Advisor*)
Display area: **28**

Biodiesel can be produced via transesterification of a free-fatty acid containing lipid feedstock using BF_3 in a Lewis-acid catalyzed process. This produces a renewable fuel substitute and/or additive for use in diesel engines. Waste vegetable oil and wild herb/weed seed oil are two types of low cost feedstocks for biodiesel production. Acid-catalyzed transesterification with use of simple alcohols has been shown to be a preferable method when compared to base catalysis when lipids contain free-fatty acids. A main goal of this project was to optimize the production of biodiesel via Lewis-acid catalysis and apply this optimized method to conversion of waste Camelina oil to biodiesel. Analysis of the percent conversion to biodiesel was accomplished using ^{1}H-NMR spectroscopy. In addition, Soxhlet extraction of Cuphea seeds was performed and gave a 25% yield of Cuphea oil. MALDI-TOF mass spectrometry was used to analyze a portion of the lipid profile of this oil. Further studies could confirm our lipid analysis and assess the practicality of using BF_3-catalysis in waste oil conversion to biodiesel.

GENETIC AND PHENOTYPIC CHARACTERIZATION OF WOYOTES: AN EXPERIMENTAL HYBRIDIZATION OF WESTERN WOLF WITH WESTERN COYOTE
Vladimir Petrenko
Anoka Ramsey Community College
Paula Croonquist (*Faculty Advisor*)
Display area: **29**

Nevada

THE CAPTURE, ISOLATION AND IDENTIFICATION OF BACTERIA FROM THE TRUCKEE RIVER IN RENO, NEVADA
Jessica McDonald, Kristen Sommerfeld, Laura Briggs
Truckee Meadows Community College
Laura Briggs (*Faculty Advisor*)
Display area: **30**

The goal of this research project is to isolate and identify bacteria found in the Truckee River, which flows through Reno, Nevada. To perform this procedure water samples were collected and plated on tryptic soy agar (TSA) and Nutrient agar (NA) plates and incubated at temperatures ranging 17 to 30°C. Pure cultures were established by streaking for isolation. DNA from isolated bacterial colonies were extracted and 16S ribosomal DNA was amplified by PCR and sequenced by NGC-Sanger sequencing. The DNA sequences were analyzed using NCBI-MegaBlast for identification. Purified and identified bacteria will be used as hosts for the capture of bacteriophage from native waters. The significance of this research is to provide information regarding the different strains of bacteria, including possible disease causing bacteria, and the subsequent isolation of bacteriophage. This research could provide potential therapies against antibiotic resistant bacterial pathogens.

INVESTIGATION OF THE HOST SPECIFICTY OF MYCOBACTERIOPHAGES CAPTURED AND PURIFIED FROM NEVADA SOILS
Leah Whitefield, Leonard Naegele, Kimberly Penrose, Summer Strickland, Tina Slowan-Pomeroy, Laura Briggs
Truckee Meadows Community College
Laura Briggs (*Faculty Advisor*)
Display area: **31**

Bacteriophages are viruses that can infect and kill bacteria. Most are specific and can only infect one bacterial host. Others have the ability to infect a range of bacterial species. This research project tests the ability of *Mycobacteriophages* to cross-infect other bacteria in the *Actinobacteria* family. The effectiveness of infectivity on different hosts will be compared to the control host, *Mycobacterium smegmatis.* This research will help provide a database of bacteriophages that can infect *Actinobacteria* which may result in potential phage therapy for the treatment of antibiotic-resistant bacterial infections.

New Mexico

CULTIVATION AND IDENTIFICATION OF ANTARCTIC MOLD
Samuel Johnson, Ryan Pottenger
Mesalands Community College
Gretchen Gurtler (*Faculty Advisor*)
Display area: **32**

In Antarctica, teams from NICL (National Ice Core Laboratory) drill deep into the ice to extract ice cores. Air pockets trapped in these ice cores yield valuable data about the Earth's past climate. To date, ice core samples over 800,000 years old have been extracted from Dome C location. A donation of a small chunk of ice from an ice core was recently donated to Mesalands Community College. Two students were assigned to analyze the melted remains of this ice segment and attempt to cultivate bacteria. Using a bed of algae based agar and a small sample of the melted ice, an attempt was made to grow bacteria. Before removing the sample from the sterile container with a sterile pipet it was clear that an object that resembles mold had been forming in the container. A sample was removed and placed on two augur beds in sterile petri dishes and left to grow in a sterile hood. Within one week, a mold colony had begun to develop. In Antarctica, mold is uncommon. In 2007, researchers from the University of Minnesota identified mold growing within the historic huts of British explorers Ernest Shackleton and Robert Scott. This mold was identified as wood mold. Other species have aso recently been found. The challenge of this project is to identify the mold and determine if it is one of the recently described species or a new species.

New York

LET'S GET SUDSY: A QUALITATIVE AND QUANTITATIVE ANLALYSIS OF MASS MEDIA CAMPAIGN TO PROMOTE HAND HYGIENE ON A COLLEGE CAMPUS
Myriah Bodie
SUNY Broome Community College
Kimberly McLain (*Faculty Advisor*)
Display area: **33**

Handwashing can prevent up to 80% of diseases (CDC, 2016). Studies found participants stated they understand the importance of handwashing but only a small percentage know how to and perform it (White, et al., 2005; Surgeoner et al., 2009; Borchgrevink et al., 2013). Students exposed to hand hygiene campaigns understood the benefits, practiced more, and experienced less illnesses than those not exposed (Moe et al., 2001; White, et al., 2005). It was proposed that college students have a lack of awareness about proper hand hygiene; however, improvements in knowledge and performance will occur with targeted media campaigns. A campus-wide survey was conducted assessing participants' hand hygiene habits. The survey consisted of 936 participants; 78% students, 22% faculty/staff. Health Studies had 30%, Liberal Arts 28%, Business/Public Services 19%, STEM 18% and 4% undeclared. Pre-media campaign survey results indicate 92% reported handwashing is important in preventing disease. Only 22% were aware of the proper length of time and 26% knew the two most important factors for effective handwashing: friction and running water. While 719 participants stated they always washed their hands after using the restroom, 716 reported observing someone leaving restrooms without doing so. Following a campus educational event, focus groups were conducted to obtain qualitative data about the impact of student produced print ads in comparison to those used by the Centers for Disease Control (CDC). A campus-wide media campaign to promote hand hygiene awareness and follow up survey to assess changes in knowledge and practice is underway.

PHENOTYPICAL CHARACTERIZATION OFA STREPTOMYCES COELICOLOR SCO3855 KNOCK OUT MUTANT

Shaina Durand
Queensborough Community College
Monica Trujillo, Naydu Carmona (*Faculty Advisors*)
Display area: **34**

Intramembrane proteases cleave transmembrane proteins inside the lipid bilayer. Rhomboid proteases belong to this group of enzymes. They are present in all forms of life and have a diversity of functions, loosely associated to signaling. *Streptomyces* are gram positive bacteria from the soil that are prolific producers of secondary metabolites with important biological functions such as antibiotics, immune suppressants and anti-cancer compounds. We aim to elucidate the biological function of rhomboids in *Streptomycetes.* These bacteria have a complex developmental cycle and a signaling system not yet fully characterized. We hypothesize that rhomboid proteases play a role in the signaling pathways of *Streptomyces* species. Constructing a strain that lacks the rhomboid gene, a knock out mutant (KO), and comparing it with the wild type strain is a strategy to test our hypothesis. The aim of the current project is to characterize phenotypically a *Streptomyces coelicolor* (the model organism for Streptomyces) rhomboid KO mutant, the SCO3855 KO, which was constructed previously by our group. Our results show that the KO strain is impaired in its ability to grow at 37º C. Additionally, the KO strain does not produce Actinorhodin, a blue pigment produced by the wild type strain. Therefore, our findings demonstrate that the *S. coelicolor* rhomboid gene, SCO3855 is involved in the life cycle of *Streptomyces*.

EASTERN BLACKLEGGED TICK DENSITY THROUGH AUTUMN IN PORT CRANE, NY
Christopher Schmidt
SUNY Broome Community College
Tracy Curtis (*Faculty Advisor*)
Display area: **35**

The eastern blacklegged (deer) tick, *Ixodes scapularis*, is the primary vector for the transmission of the bacteria that causes Lyme disease (*Borrelia burgdorferi*) in humans. This study, conducted from October - November 2016, aimed to examine the density of deer ticks (*Ixodes scapularis*) at different points throughout the autumn season. Ticks were collected with a cloth drag over measured ten meter (10 m) segments along walking trails in Chenango Valley State Park (Port Crane, NY). The first meter directly adjacent to the trail was dragged, as well as the second meter and third meter (when terrain permitted). The number of ticks, the point on the trail at which they were collected, and at which meter away from the trail they were collected from was recorded. The data was entered into Minitab as a fitted line regression, which was used to calculate the correlation coefficient (r-value) and the coefficient of determination (r-squared). The study did not find a correlation between either the date and the tick density or the average temperature and tick density. While there was no correlation demonstrated, the life cycle of the deer tick is well understood and is most likely the driving force behind fluctuations in tick density. The information gained in this study contributes to our understanding of when humans are at greatest risk of exposure to Lyme disease.

NOVEL MICROWAVE PREPARED SINGLE-WALLED CARBON NANOTUBES-ETHER IONIC LIQUIDS MIXTURES AS ELECTROLYTES FOR DYE-SENSITIZED SOLAR CELL APPLICATIONS
Rawlric Sumner, Sharon Lall-Ramnarine, Tirandai Hemraj-Benny
Queensborough Community College
Sharon Lall-Ramnarine, Tirandai Hemraj-Benny (*Faculty Advisors*)
Display area: **36**

There is a great need for the development of renewable green energy sources. In recent years, the use of dye-sensitized solar cells to replace silicon based solar cells have attracted much attention. However, more efficient electrolytes need to be developed to facilitate the increased commercialization of dye-sensitized solar cells. In this comparative study, the properties of single-walled carbon nanotubes (SWNTs) in methylimidazolium ionic liquids (ILs) bearing ether and alkyl side chains were investigated as potential electrolytes for dye sensitized solar cell applications. The ionic liquids were prepared by reaction of 1-methylimidazole with the alkylhalide or alkoxyhalide to yield the halide salt. The halide salt was then converted to the bis(trifluoromethylsulfonyl)amide (NTf_2) IL. The structures of the ILs were confirmed using H-1 and C-13 Nuclear Magnetic Resonance (NMR) spectroscopy. SWNT- IL composites were prepared by cost and time efficient microwave irradiation. The conductivity of ILs and SWNT-IL mixtures were measured using a conductivity meter in a low moisture environment. Preliminary, conductivity values greater than 3.0 mS/cm were obtained for SWNT-IL mixtures making them promising electrolytes for electrochemical devices such as dye-sensitized solar cells.

Oklahoma

WORM POPULATIONS PREDICT SOIL HEALTH
Felipe Plascencia
Redlands Community College
Dee McKenna (*Faculty Advisor*)
Display area: **37**

The purpose of this study conducted at Redlands Royse Ranch Living Laboratory is to determine if worm population can be used as an indicator of soil health. Soil health is important for increased production of agricultural land; therefore, more food is available to humans as well as livestock. An environmental benefit of healthy soil is less runoff which leads to less soil erosion and more organic material available for crop production. In this 32 acre study, five plots were randomly sampled; 6 acre conventional-tilled non-grazed, 5 acre no-tilled grazed, 5 acre no-tilled non-grazed, 10 acre no-tilled *Sure Crop* non-grazed, 6 acre control. In each plot, samples were collected from the center and four areas randomly selected by tossing a 27 cm Frisbee. Soil moisture and soil temperature were recorded prior to excavation and count of worm and wormholes. This study found more wormholes than worms with an overall increase in the worm population from the previous semester. In conclusion, the worm population is on the rise, more so with the no-tilled plots than the conventional-tilled. The increase in the worm population may be due to the increase in soil temperature, in comparison with the previous semester. Due to increasing worm populations, additional data will be collected including soil pH and fertility using the *Rapitest* probe. Expansion of soil health parameters will benefit other research conducted at Redlands Community College, the Southern Plains Climate Hub and the Natural Resource Conservation Service.

Oregon

UNSAFE LEVELS OF CADMIUM AND ARSENIC EMITTED INTO PORTLAND, OREGON'S AIR BY BULLSEYE GLASS CO.
Sahara Strothers
Portland Community College
Valance Brenneis, Josephine Pino (*Faculty Advisors*)
Display area: **38**

Texas

OCCURRENCE OF ANTIBIOTIC RESISTANT BACTERIA IN SOIL SAMPLES NEAR THE GULF OF MEXICO IN PORT ARANSAS, TEXAS

Tara Clancy
Del Mar College
J. Robert Hatherill (*Faculty Advisor*)
Display area: **39**

The Prevalence of Antibiotic Resistance in the Environment (PARE) project allows for a “crowd-sourcing" approach to study antibiotic resistance in the environment. Soil was collected from the Animal Rehabilitation Keep (ARK), where injured and sick sea turtles are given antibiotics to help improve their condition prior to being released back into the Gulf of Mexico. The PARE project’s focus is centered on tetracycline resistance, which has not been given to the turtles at the ARK for approximately five years. Following PARE protocol, the soil sample was diluted and plated on MacConkey agar and tetracycline (Tet3 µg per mL/Tet30 µg per mL) plates. The plates were incubated for 96 hours at 28°C and demonstrated 815,000 colony forming units (CFU) per gram of soil on the MacConkey plates. Tet3 showed 40,500 CFU per gram of soil, while Tet30 showed 100,000 CFU per gram of soil. Future studies include investigating the environment for resistant bacteria by testing the current regimen of antibiotics given to the turtles (enrofloxacin/ceftazidime). The current study shows bacterial isolates that are resistance to tetracycline, which could result from lateral gene transfer from commensal bacteria. While sea turtles are known carriers of antibiotic resistant genes, this study shows the effect of encountering multiple antibiotics in their environment, along with the prevalence of antibiotic resistance within a coastal community.

USING THE DNAB HELICASE GENE IN THE MYCOBACTERIOPHAGE 'WYATT2' TO FURTHER UNDERSTAND M. TUBERCULOSIS

Wyatt Hooks
Del Mar College
J. Robert Hatherill, Daiyuan Zhang (*Faculty Advisors*)
Display area: **40**

In 2015, it was reported about 1.8 million people died from tuberculosis. *Mycobacterium tuberculosis* causes infectious tuberculosis. Mycobacteriophages are viruses that infect mycobacterial hosts, such as *Mycobacterium tuberculosis (TB)* and *Mycobacterium smegmatis (M. smeg)*. In this project we purified, sequenced, and annotated a novel Mycobacteriophage named 'Wyatt2'. 'Wyatt2' is classified as a cluster L, sub cluster L1 with 122 putative genes and 9 putative tRNAs. *M. smeg* is the host bacteria used to isolate Wyatt2 because it's closely related to *TB*. Based on GeneMark coding maps, we found that 'Wyatt2' had higher coding potential to *TB* then *M. smeg*, which may suggest a closer lineage. We counted 122 genes in total and compared each gene between the *M. smeg* and *TB* GeneMark coding maps. In fact, about 96.7% of genes from 'Wyatt2's genome had coding potential with *M. tuberculosis* while about 73.8% of genes with *M. smeg*. During annotation of Wyatt2's genome, gene number 68 in the sequence had similar characteristics to DnaB helicase. DnaB functions as a helicase by unwinding DNA. This process starts when DnaA loads a DnaB-DnaC complex onto the DNA. Once the DnaB reaches the replication fork DnaC is released, DnaB then begins to unwind the DNA. The DnaB helicase in Wyatt2's genome has the potential to give further insight of the function of DnaB in *TB*. Future studies include the mechanism for DnaB, which could potentially create a drug target to stop or hinder the replication of pathogenic multi-drug resistant *TB*.

A DEVELOPMENT OF AN *IN VITRO* MODEL OF BACTERIAL EVOLUTIONOF DRUG RESISTANCE

Josceline Romanielle M. Teñido
Lone Star College Montgomery
Julie Harless (*Faculty Advisor*)
Display area: **41**

Bacterial evolution of resistance to antibiotics was evident from early studies of bacterial genetics; and this resistance was quickly seen in patient samples in the 1950s. Over time, as patients incorrectly take their antibiotics, resistant bacteria become the majority population. To simulate the development of drug resistance *in vivo*, an *in vitro* method was developed. Previous works have approached the study of evolution of resistance either *in vivo* in clinically relevant doses or *in vitro* with extremely low concentrations of antibiotics. These *in vitro* studies failed to address the effects of antibiotics at clinically relevant doses. In my experiments, bacteria were exposed to the concentrations of antibiotic just below minimal inhibitory concentration (MIC) to select for mutant organisms. In addition, an ultraviolet spectrophotometer was used to determine growth curves of bacteria in different concentrations. The bacteria repeatedly exposed to lower concentrations eventually developed very high resistance to antibiotics, which models a patient incorrectly taking antibiotic. The results are compared with acute exposure to clinically appropriate doses.

Washington

EXPLORING THE EXTRACTION OF MICROPLASTICS FROM HARBOR SEAL SCAT
Arianna Calvin, Bradie Ferguson
Everett Community College
Ardi Kveven (*Faculty Advisor*)
Display area: **42**

Microplastics are a potential pathway for the accumulation of Persistent Organic Pollutants, and the abundance of microplastics in scat indicate their overall presence in the food chain. This project utilizes Harbor Seal (Phoca vitulina) scat that has been processed for prey target extraction. Samples were collected within the Puget Sound region, under a NOAA permit as part of a broader study for prey targets. Collection of these samples occurred on 25 dates ranging from March to June of 2016. After these samples were sieved for large fish bones, the resulting slurry is now being tested for the presence of microplastics. The working assumption is that microplastics are assimilated by prey, the organic matter of the prey is broken down in the intestinal tract of the seal, and then microplastics are excreted with waste. Pioneering methods for the extraction of microplastics in seal scat include visual microscopic observation, filtration, and centrifuging. Thus far centrifuging has yielded the highest amount of microplastic observation.

PROOF OF PRINCIPLE OF AN ATMOSPHERIC PRESSURE PLASMA JET FOR SPACECRAFT STERILIZATION FOR NASA

Stephani M. Bernard, Cali K.P. Drake, Thinh P. Pham, Wei Liao, Christopher V. Nguyen, Nhy Tran, Emma Brasseur, Hyoseo Jang, Yasmin Dunn, Jonathan A. Miller
Edmonds Community College
Jonathan A. Miller (*Faculty Advisor*)
Display area: **43**

NASA confronts a forward contamination problem with the launch of spacecraft and probes into extraterrestrial environments with potential for detection of life. Microbial control is required in order to avoid cross contamination that would compromise data collected. Currently approved decontamination methods are costly and involve high heat and chemical treatments which risk damaging thermally sensitive spacecraft materials and components. Alternative methods, including atmospheric pressure plasma jets (APPJs), show promise as effective technologies for microbial control. Researchers at Edmonds Community College partnered with Eagle Harbor Technologies (EHT) of Seattle, WA to test the capabilities of an APPJ developed by EHT, performing characterization of killing efficacy and demonstrating proof of principle for large-area spacecraft sterilization. Research demonstrated killing capabilities of APPJ when applied to various conditions including different surface materials, meshes, tapered and elevated holes. The plume of the APPJ traveled through tapered and elevated holes yielding greater than 99% killing of endospores. Application of APPJ as a "brush" demonstrated greater than a 6 log reduction of endospores over 56.75 cm^2/10 minute exposure. Findings suggest a brush composed of multiple jets could be effective for spacecraft sterilization over large surface areas of differing materials with capability to penetrate unusual shapes and surfaces. Anticipated improvements in killing efficacy resulting from better characterization of increased voltage, frequency, humidity, and the inclusion of low O_2 concentrations should lead to the development of an APPJ brush effective at spacecraft sterilization.

SEASONAL VARIATION OF NORTH AMERICAN RIVER OTTER (LONTRA CANADENSIS) PREDATION ON LOCAL FISH SPECIES

Alena Eldridge
Everett Community College
Robin Araniva, Ardi Kveven (*Faculty Advisors*)
Display area: **44**

Lontra canadensis, or the North American river otter, is a member of the mustelid family residing in estuarine and riparian environments such as the Snohomish River estuary system in Everett, WA. Ocean Research College Academy (ORCA) collected *L. canadensis* scat samples near the Port of Everett for dissection and seasonal diet analysis. Past research found that the diet of *L. canadensis* is comprised of fish, crustacean, and avian prey at the mouth of the Snohomish River. Current research to identify prey species in the scat are now underway with the extraction of bony parts for genetic analysis at Shoreline Community College. Camera traps were set and monitored using motion sensors at known latrine sites and surface temperature were monitored monthly using a YSI probe. Preliminary genetic results identified *Oncorhynchus gorbuscha,* or pink salmon, during the fall of 2013, demonstrating opportunistic predation on available salmon species during the biennial migration. Further questions being explored include a correlation with increased consumption of faster swimming fish during colder seasons or with larger groups gathering at latrine sites. Characterization of seasonal, interannual, and social factors affecting the diet of *L. canadensis* can raise awareness of other environmental stressors in the ecosystem, such as fish population changes and changes in prey availability.

EFFICACY OF AN ATMOSPHERIC PRESSURE PLASMA JET FOR SPACECRAFT STERILIZATION FOR NASA

Thinh P. Pham, Cali K.P. Drake, Stephani M. Bernard, Christopher V. Nguyen, Wei Liao, Nhy Tran, Emma Brasseur, Hyoseo Jang, Yasmin Dunn, Jonathan A. Miller
Edmonds Community College
Jonathan A. Miller (*Faculty Advisor*)
Display area: **45**

NASA confronts a forward contamination problem with the launch of spacecraft and probes into extraterrestrial environments with potential for detection of life. Earth-origin microbes risk threatening planetary systems, compromising the data obtained, and require implementing microbial control for planetary protection from cross contamination. While generally effective, currently approved decontamination methods are costly, involve high heat and chemical treatments, and risk damaging thermally sensitive spacecraft materials and components. Alternative methods, including atmospheric pressure plasma jets (APPJs), show promise as effective technologies for microbial control. Researchers at Edmonds Community College partnered with Eagle Harbor Technologies (EHT) of Seattle, WA to test the capabilities of an APPJ developed by EHT, performing characterization of killing efficacy. *Bacillus atrophaeus* endospores were spread on Trypticase soy agar plates to quantify killing efficacy of over 900 combinations of APPJ parameters including pulse width, frequency, voltage, distance, time, electrode placement, jet configuration, gas composition, and flow rate. Unprecedented independent control of APPJ pulse width, frequency, and voltage allowed researchers to identify combinations of these parameters resulting in greater than 4-log reduction of endospores. A decimal reduction time (D-value) was additionally determined at an average of 160 seconds on aluminum. High humidity and low concentrations of O_2 were identified as conditions that enhanced killing of endospores. Further characterization of higher voltage, frequency, and humidity, as well as variable pulse width and low O_2 should lead to improved APPJ killing efficacy with decreased exposure time and allow for development of an APPJ optimized for microbial reduction for large-area spacecraft.

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The CCURI model of incorporating undergraduate research (UR) into community college curricula, engages students from the moment they enter the classroom. The model employs active learning methods of instruction in the first year coursework, which teaches basic scientific concepts within the context of an ongoing research project. Students are then given an opportunity to explore those projects as either a CURE (Course Undergraduate Research Experience), a SURE (Summer Undergraduate Research Experience) or a PURE (Program Undergraduate Research Experience). The growing CCURI network has become a rich source of collaboration on both the curricular and research sides of the CCURI model. With over 50 community colleges implementing the CCURI undergraduate research model; thousands of students are connected to research and opportunities that are vital to the successful pursuit of a STEM career.

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