



# URSA

Undergraduate, Research,  
Scholarship and Arts.  
Benedictine University

## 2015 Poster Session Program

April 9, 2015 ♦ 12:00-5:30 pm ♦ Krasa BC

### **Miles Adamski, Farina Kanwal**

"Morphometric Analysis of Fossils using 3D Laser Scanner and Printer"

Since 3D printers were first used in the late 1980s, the use of 3D printers has evolved in many different ways. Laser scanners are now used to obtain an exact shape, size and any intricate detail to create a precise model of the object using the 3D printer. Although these printers are being used in several different fields of science, their use to recreate and study fossils is still relatively new. Laser scanners can be used to create 3D images of fossils and 3D printers can be used to create their plastic models. Where old original fossils are delicate and are at risk of harm, 3D models would provide researchers with an easy way to study fossils, including how they moved, lived and ate in their environment. Scans of fossils can also further be manipulated by editing a part of their body which will enable us to study what role a specific part of their body, like spine, played. We report how 3D laser scanners and printers can be used to do morphometric analyses of fossils. The study involves testing how the scanners work, what factors affect the scanning quality, which resolution can printers print and, finally, what adjustments are required in the scanned files to obtain a good quality printed model. Therefore, the presented work includes testing several different hypotheses about the 3D scanner and printer so that specific requirements are known before using the actual fossils to create models.

*Faculty sponsor: Phil Novack-Gottshall*

### **Jessica Avanzado**

"Nanoparticles as Decontaminants"

Due to their special chemical properties, nanoparticles have the potential to decontaminate water and soil. Research has shown that nanoscale zero-valence iron (nZVI) is particularly efficient in removing contaminants, such as arsenic, from water, and soil, but research is lacking in understanding the long term effects of nZVI on its surrounding environments. As a result, I propose that research should focus on how the ageing of nZVI affects plant life and the microbial environment of soil over the course of 5 years.

*Faculty sponsor: Jean-Marie Kauth*

### **Afreen Ahmed**

"Ontogeny of Basicranial Flexion in Primates"

In contrast to other primates, the human basicranium flexes during development, a process thought to be related to the size of the brain relative to basicranial length. In order to test this hypothesis, we looked at the relationship between basicranial flexion and relative brain size in x-rays of juvenile and adult howler monkeys (*Alouatta palliata*, *A. seniculus*), long-tailed macaques (*Macaca fascicularis*), proboscis monkeys (*Nasalis larvatus*), orangutans (*Pongo pygmaeus*), gorillas (*Gorilla gorilla*), chimpanzees (*Pan troglodytes*), and modern humans (*Homo sapiens*). We found that differential growth of the brain and basicranium in humans and non-human primates helps to explain the differing degrees of basicranial flexion in these species.

*Faculty sponsor: Robert McCarthy*

**Noor Akhter, Amy Klingbiel**

**“An Exploration of the Diversity of Pollinators in Northern and Central China”**

The agricultural industry is largely dependent on insect pollination. However, the number of honeybees throughout the world is decreasing due to a complex set of variables. Our objective of this research was to determine the diversity of species in different areas of China; primarily urban sites and their diversity. Data was collected in China by student researchers in the Benedictine University China Pollination Project (BUCPP) in the summer of 2014. Using this data, in the form of photographs and field notebook entries, we identified the insect and plant species present. Looking through the data, we were able to identify how the diversity and types of pollinators differed based on location. Our data will serve as a reference to assist future groups of student researchers participating in the BUCPP.

*Faculty sponsor: Cheryl Heinz*

**Hera Azim, Sana Quadri**

**“Optimization of Glutamate Dehydrogenase Based Enzyme Assay for the Electrochemical Detection of L-Glutamate”**

In previous studies, the most common methods for the detection of L-glutamate have utilized the enzyme Glutamate oxidase (GmOx). Though this method of detection is used frequently, GmOx is oxygen-dependent and therefore limited oxygen availability can alter the electrochemical detection response. A few past studies have shown that the enzyme Glutamate dehydrogenase (GLDH) can be used for the electrochemical detection of L-glutamate. Since little is known about the electrochemical GLDH-based biosensors, the development and optimization of this enzyme assay combined with the sensitivity and reliability of electrochemical detection can help create new method for quantifying L-glutamate.

*Faculty sponsor: Niina Ronkainen*

**Jeremy Bingen, Zaed Hussain, Fauzia Mujid**

**“Electrografting of molecules and metal complexes onto conductive surfaces”**

Electrografting is a powerful technique that applies electrochemical methods to covalently bond organic molecules and metal complexes to solid surfaces using radical-based chemistry. The technique has numerous applications, including the production of sensors, the protection of electrodes, and the attachment of catalysts to surfaces. Our research is focused on the synthesis and characterization of precursor molecules and complexes, as well as modified surfaces, with the goal of identifying new classes of molecules that are suitable for grafting in this manner. One class of molecules we are targeting is boron-containing molecules, such as arylboronic acids and trifluoroborates, which have been used successfully in radical organic reactions.

*Faculty sponsor: Sarah Shaner*

**Divya Boggavarapu**

**“The Hope and Struggle for Peace in Myanmar”**

Myanmar was in a state of severe post-colonial strife and political conflict when a pro-democracy movement emerged in 1988. The leader of the movement was the daughter of General-Major Aung San, the captivating and charismatic Aung San Suu Kyi, who founded the National League for Democracy (NLD) and was awarded the Nobel Peace Prize in 1991 for her efforts to introduce democracy and peace in Myanmar. The mission of Suu Kyi, as well as other Burmese non-violent organizations, is to create peace among the political and social strife in Myanmar as well as introduce democracy to a post-colonial nation that continues to be rampant with violence, poverty, and corruption.

*Faculty sponsor: Fannie Rushing*

**Julie Carroll, Seerat Hassan, Kiran Munir, Zack Oesterreicher**

**“Using Worms to Study the Effect of a Primary Bile Acid on Intestinal Function”**

In mammalian cells, excess luminal bile acids have been shown to induce inflammatory bowel disease-associated diarrhea; hence we are investigating the role of cystic fibrosis transmembrane conductance regulation (CFTR), an apical Cl<sup>-</sup> channel in the ABC-superfamily using both a *Caenorhabditis elegans* model and T84 human colon carcinoma cells. An

osmotic stress assay will be used to study the effects of the unconjugated primary bile acid, chenodeoxycholic acid (CDCA) on intestinal morphology and integrity in *C. elegans* and a cell viability/apoptosis assay performed to test the toxicity of CDCA on T84 cells. *C. elegans* and T84 cells are excellent models to study the effects of bile acids on fluid regulation in both individual cells and intact organs.

*Faculty sponsors: Tanya Crum, Jayashree Sarathy*

### **Saira Chatha**

**“The Effect of Air Pollution on Congenital Heart Disease and Defects”**

I will discuss multiple studies that have shown a positive correlation between maternal exposure to air pollution and an increased risk of congenital heart disease in offspring. I will also address the next possible step in regards to this issue.

*Faculty sponsor: Jean-Marie Kauth*

### **Taylor Chazinski, Dominique Galloway, Kirsten Pope, Stephanie Vavrina**

**“Involving Parents in Their Child’s Education”**

This is a presentation about communicating and collaborating with parents, including actively involving parents in their child’s education. We will also explain strategies for planning and implementing a parent-teacher conference.

*Faculty sponsor: MeShelda Jackson*

### **Humdoon Choudhry, Rabia Choudhry**

**“Investigating the Role of ABC Transporters and Bile Acids in Intestinal Fluid Regulation”**

Bile acids and cystic fibrosis transmembrane conductance regulator (CFTR), an ABC-transporter, have been implicated in inducing diarrhea in individuals with inflammatory bowel disease and we are using the model organism *Caenorhabditis elegans* to study the effects of bile acids on intestinal fluid regulation. Wild type worms and ABC-transporter mutants, *C. elegans* will be fed unconjugated primary (CDCA) and secondary (LCA) bile acids ([250nM] each), allowed to grow, and assayed for osmotic sensitivity by quantifying exploded worms. This excellent model system will help identify the connection between ABC transporters and the effects of bile acids on the intestinal physiology of an intact organism can be extended to understanding of these processes in the human GI tract.

*Faculty sponsor: Jayashree Sarathy*

### **Joseph Cruz, Renee Habbal, Evan Jenkins, Matthew Raub**

**“Discovering drugs to treat McCune-Albright Syndrome”**

McCune - Albright Syndrome is a genetic disorder in which there is a mutation at position R201 in the GNAS gene, causing the Gs alpha subunit of heterotrimeric G-proteins to be constitutively active, elevating intracellular cAMP levels and leading to a wide range of health issues. In our quest to find a compound that could decrease intracellular cAMP levels, thereby alleviating symptoms of the disease, we tested 18 different drug compounds, predicted by molecular modeling to bind to a critical region of Gs alpha, for their ability to decrease intracellular cAMP levels in HEK cells overexpressing mutated Gs alpha. Five drugs showed decreases in cAMP levels, and were further studied by varying the dose of drug in the cAMP experiments, and by measuring the toxicity of the drug to the cells in cell viability assays.

*Faculty sponsor: Robin Rylaarsdam*

### **Eunnice Deiparine, Patrick De Leon, Teresa Rokosz**

**“Caring for Patients without Restraint Interventions”**

Restraints are still in use in some healthcare facilities in an effort to promote safety and prevent falls or injuries. A review of the literature reveals a lack of competence or knowledge associated with restraint use, resulting in potential deficits in caring for basic patient needs. Our proposed plan to implement change is to create a pathway for nurses prior

to initiating restraint use and to create more awareness in identifying patient needs.

*Faculty sponsor: Patricia Brown*

**Sally Jo Detloff**

**"A Comparison of the Effects of Bile Acids on Trans-Epithelial Resistance and Cytokine Production in Human Colon Carcinoma, T84 Cells"**

Possible pathophysiological mechanisms of diarrhea associated with inflammatory bowel disease could include the presence of high levels of bile acids in the lumen of the colon or the resulting shifts in pro-inflammatory cytokine production. Disruption of the epithelial barrier caused by bile acids was quantified by measuring the trans-epithelial resistance (TER) across T84 (human colon carcinoma cells) monolayers and the production of a predominant cytokine, TNF $\alpha$ , induced by varying concentrations of bile acids was measured with an ELISA assay. It was found that chenodeoxycholic acid (CDCA) caused a decrease in TER, while lithocolic acid (LCA) had no effect and neither CDCA or LCA induced the production of TNF $\alpha$ ; involvement of other cytokines are currently being investigated.

*Faculty sponsor: Jayashree Sarathy*

**Elizabeth Do, Bichnu Le, Firdous Moin, Kyle Turcic, Sivaranjini Velanthottukoottale**

**"Bee-dazzled: Native pollinator diversity across five sites in China"**

The apparent reduction of native pollinators poses a deleterious effect to the agricultural industry with impending global implications. The purpose of this research study is to assess the pollinator diversity across different urban sites in China, including the Beigou Village, Beijing, as well as different sites in the provinces of Liaoning, Sichuan, and Shaanxi. We recorded different environmental factors such as temperature, humidity, and cloud cover in order to find different trends affecting pollinator prevalence and frequency. Beijing municipality and Liaoning province showed significantly greater pollinator diversity and frequency amongst the different sites. Further data analysis is required to explain and isolate the reasons behind these apparent trends. In summer 2015, another group of students will continue our research with the goal of further characterizing the variables that impact Chinese pollinators in Beijing and Liaoning province.

*Faculty sponsors: Steven Day, Cheryl Heinz*

**Jermeen El-Zabet**

**"Network architecture of the US railroad and highway transportation systems"**

We study the network structure of railroad and highway systems in the contiguous United States as part of a larger study of invasive species. We use randomizations of the network to test if the observed structure was stronger than one would expect by chance. The results indicate that neither the railroad system nor the highway system has any significant small-world structure, when randomizations are constrained amongst geographically adjacent counties. Global randomizations do indicate small-worldness for both networks, yet here links are allowed between counties that do not share a border, and the networks are no longer planar graphs. We also tested a non-transportation network where edges were formed between counties if they simply shared a border; in this simple planar graph, the same pattern was found wherein geographically-constrained randomizations indicated no small-world structure while global randomizations indicated significant small-world structure. We conclude that small-worldness detected in transportation studies likely arises from the planarity of the graphs, and not necessarily from a small-world organization of the transportation links embedded within that graph. These findings will inform our work on the spread and control of invasive plants.

*Faculty sponsor: Preston R. Aldrich*

**Robert Fialkowski**

**"CRH regulation of Cichlids"**

Corticotropin releasing hormone (CRH) is a hypothalamic neurohormone that is released at the onset of stress to influence secretion of pituitary corticotropin and release of adrenal corticosterone in vertebrates. The goals of the

research project is to determine the mechanism in which *crh* expression is regulated by looking at the cis-regulatory region. Using the cichlid genome database I will characterize transcription factor binding sites of the *crh* gene and compare the regulatory region and transcription binding sites between species.

*Faculty sponsor: Peter Dijkstra*

**Nikki Gullett, Sarah Mustaly**

“Selected Trace Element Analysis of Berry Liquors from Northern Europe”

Certain trace elements in beverages may affect human health via contribution to dietary intake and possible toxicity in the event of excessive intake. Flame atomic absorption spectroscopy was used to analyze trace iron, copper, zinc, manganese, and magnesium concentrations found in Northern European liquor made mostly for domestic consumption from organic berry extracts, such as cranberry, cloudberry, raspberry, black currant, strawberry, blueberry, buckthorn berry, artichoke, and cherry. Generally, magnesium had the highest concentration, while iron had the lowest.

*Faculty sponsor: Niina Ronkainen*

**Cassidy Gurgone-Galka**

“Pesticide Dichlorvos correlation with Leukemia”

A discussion of the harmful effects of the pesticide Dichlorvos, specifically the development of Leukemia.

*Faculty sponsor: Anne Marie Smith*

**David Hung, Taliha Nadeem**

“Is Lithocholic Acid as ‘Toxic’ as Originally Thought?”

The presence of excess bile acid in the colon, particularly dihydroxy bile acids such as chenodeoxycholic acid (CDCA), is known to increase fluid secretion and result in diarrhea. Bile acids may promote fluid secretion, either by increasing membrane permeability or decreasing the integrity of cells themselves. We are currently investigating potential mechanisms by which lithocholic acid, LCA, a dehydroxylated product of CDCA, had similar effects. We first studied if LCA was as “toxic” to the cells as has been implicated. After a series of tests, we found that varying concentrations of LCA with increasing exposure time neither affected cell viability nor apoptosis, nor was it cytotoxic to cells.

*Faculty sponsor: Jayashree Sarathy*

**Sarah Hussey**

“Yoga Practice and Mood: A Cross-Sectional Study in Healthy People”

People who practice yoga have reported living healthier lifestyles, and accumulating evidence has linked yoga practice with numerous physical and mental health benefits. We analyzed existing data from a large online survey that had investigated mood and lifestyle factors in vegans, vegetarians, and non-vegetarians for the purpose of examining factors associated with yoga practice, and found that participants who practiced yoga reported lower depression and healthier lifestyle factors including greater fruit and vegetable intakes than those who did not practice yoga.

*Faculty sponsor: Bonnie Beezhold*

**Farnia Kanwal, Jismon Kuruppath, Cheryl Thokkudubiyaapu, Abdul Ward**

“Comparing Human Error Rates in Textual Analysis of Paleontological Data”

Paleontological data are widely used in modern biological research, but these data are often compiled from published literature, which is a time-intensive process. Here, in order to examine these error rates, multiple human subjects manually compiled data independently from a single text source, the gastropod volume of the *Treatise on Invertebrate Paleontology*. Results demonstrate the extent to which human subjects are prone to multiple forms of errors when replicating data through textual analysis.

*Faculty sponsor: Phil Novack-Gottshall*

**Erik Kerberek**

“DIN and Rising Temperatures, the Perfect Recipe for Bleaching”

Coral bleaching is a huge issue we face today due to the rising ocean temperatures caused by climate change. Dissolved inorganic nitrogens further the stress on the corals which ultimately causes them to bleach and die.

*Faculty sponsor: Jean-Marie Kauth*

**Asfia Khan**

“Social media and consumer production”

This presentation focuses on environmental sustainability and social media, specifically the phenomenon of e-waste. Given the influence of technology on what we wear, what we buy and even how we think, social media can be seen as actually causing environmental destruction.

*Faculty sponsor: Anne Marie Smith*

**Hiba Khan**

“The Effects of Environmental Factors on Indigenous Peoples in Australia”

My research analyzes prior research that has been done on the affects of environmental and climate change on Indigenous Australians. It focuses on the perspectives of Indigenous peoples on climate change, the affect of climate change on their belief system, and the role of developers, government officials, and Aboriginal activists on the literal environment of these peoples.

*Faculty sponsor: Jean-Marie Kauth*

**Nabihah Khan**

“What’s Loosing Up Your Tight Junctions? A Study to Determine the Role of Bile Acids and Cytokines in Inflammatory Diarrhea”

Irritable bowel diseases such as Crohn’s disease or colitis, can cause a disruption of tight junctions in colonic cells, causing fluid loss and diarrhea. Bile acids have been implicated in this process, and using the unconjugated primary bile acid, chenodeoxycholic acid (CDCA) and its secondary bile acid, lithocholic Acid (LCA), we have previously shown that CDCA can disrupt tight junction barriers and in the presence of pro-inflammatory cytokines this effect is exacerbated; in contrast, LCA does not affect tight junctions in the presense or absence of proinflammatory cytokines. This study demonstrates that bile acids can disrupt tight junctions in individuals with irritable bowel diseases and LCA or its derivatives could be used as a therapeutic drug to help treat these bowel diseases.

*Faculty sponsor: Jayashree Sarathy*

**Amy Klingbiel, Nemanja Krstic, Matthew Raub, Mirela Trifonova**

“Determination of the Effects of the ‘Toxic’ Secondary Bile Acid, Lithocholic Acid, on *C. elegans* and Human Colon Cancer Cells”

The ABC-transporter superfamily includes the human Cl<sup>-</sup> channel cystic fibrosis transmembrane conductance regulator (CFTR) which contributes to bile acid induced fluid secretion and diarrhea in individuals with Irritable Bowel Syndrome and Crohn’s Disease via an unknown mechanism. We are using the model organism *Caenorhabditis elegans* to study the role of PGP-3, a CFTR homolog expressed in worm intestines, and the unconjugated secondary bile acid lithocholic acid (LCA) on intestinal morphology and response to osmotic stress. LCA is considered to be toxic to cells and the effect of LCA on cell viability will also be tested using a model human colon cell line, T84.

*Faculty sponsors: Tanya Crum, Jayashree Sarathy*

**Kristen Knaak****"Art Therapy through Duct Tape"**

Artwork is a form of therapy. These pieces could be considered art as therapy and would be used in the art therapy field to help the client reach a cathartic state, or a state of emotional release. It requires creativity, focus, and patience which lends itself to being an emotional outlet.

*Faculty sponsor: Stacy Barber*

**Monica Kunkel****"Spatial Constraints on the Timing of Molar Eruption in Chimpanzees (*Pan troglodytes*): A Case Study Involving Ectopic Molar Eruption"**

In primates, species-specific rates of facial growth open up space in the jaws and are hypothesized to influence the timing of molar eruption. We discovered a zoo chimpanzee specimen at the Field Museum of Natural History that combines an unusually small face and a pair of molars that have erupted ectopically into the maxillary sinuses bilaterally. This condition is exceedingly rare in chimpanzees and allows us to directly test the spatial constraints hypothesis for molar eruption timing using a non-human primate model.

*Faculty sponsor: Robert McCarthy*

**Sarah Mustaly****"Analysis of Modern Human Vowel Sounds for Comparison to Neanderthal-like Vowel Sounds"**

The shape of the tongue and vocal tract allows humans to produce "quantal" vowels (such as /i/, the vowel of "he," /a/, the vowel of "ha," and /u/, the vowel of "who") that enhance speech perception. Previous research indicates that the shape of the vocal tract in Neanderthals, an extinct modern human relative, is closer to chimpanzees than to modern humans; Neanderthals would therefore have had a diminished ability to produce quantal vowel sounds. In order to understand how the acoustic properties of estimated Neanderthal vowel-like sounds compare to modern human vowels, we analyzed acoustic properties for 16 previously-recorded vowels in 100 subjects using the programs Praat and Akustyk, and compared formant frequencies of these vowels to formant frequencies analyzed in a large study by Hillenbrand and colleagues (1995).

*Faculty sponsor: Robert McCarthy*

**Cameron Pombert, Mahmoud Abdel, Mohammed Farhan, Harsh Sharma****"Synthesis of Biologically Active Organic Endo-peroxides using Organocatalysis"**

Artemisinin, an endo-peroxide containing molecule, is currently the frontline treatment for malaria; however, high production costs have limited its availability in underdeveloped countries. Organocatalysis allows for the rapid and economical synthesis of complicated organic molecules. An organocatalyzed tandem acetal formation/oxo-Michael reaction was used to create a library of new synthetic endoperoxide molecules that will be tested for anti-malarial activity and cancer cell cytotoxicity.

*Faculty sponsor: David Rubush*

**Judith Stanford****"Aggression in *Neochromis omnicaeruleus* due to Degree of Melanism"**

Body pigmentation and aggression are often correlated traits in vertebrates. The purpose of this project was to determine if the amount of black coloration correlated with the amount of attacks seen in the cichlid fish *Neochromis omnicaeruleus*. The analysis was done in Image J software to determine the percentage of black coloration in each fish.

*Faculty sponsor: Peter Dijkstra*

**Michael Strojny****“Stereoselective Synthesis of Endo-peroxide Containing Molecules”**

Chiral organocatalysts have been used to rapidly build complex organic molecules in high enantioselectivity. Phosphoric acid catalysts were employed in an acetalization/oxo-Michael reaction to create new chiral bicyclic endo-peroxide containing molecules in high stereoselectivity. These novel molecules will be tested for anti-malarial activity and cancer cell cytotoxicity.

*Faculty sponsor: David Rubush*