



URSA

Undergraduate, Research,
Scholarship and Arts.
Benedictine University

2016 Oral Presentation Schedule

12:00-1:30 pm – Goodwin 320

◆ Sana Quadri

“Learning Assistant Inclusion in a General Chemistry Classroom”

An original research project is being conducted as part of a formal Learning Assistant (L.A.) program at Benedictine University. The L.A. program is supported by the Benedictine Educating Stem Teachers (B.E.S.T.) program in conjunction with the National Science Foundation (NSF) Noyce teacher preparation grant. Committing approximately 10 hours a week as an L.A. in General Chemistry 1 (CHEM 113), my responsibilities included: attending class to help facilitate active student learning, holding regular weekly help sessions, leading a monthly review help session for exams, grading/analyzing homework assignments, participating in bi-weekly seminar course on teaching pedagogy, and meeting weekly with supervising professor to plan for class activities. The purpose of this study is to determine if there is a beneficial relationship of utilizing an L.A. in a classroom and active learning pedagogies. The control group for this study was the Fall 2015 CHEM 113 class where there was no L.A. in the classroom, no homework, and no in-class inquiry worksheets. Preliminary results show a positive correlation between L.A. structured classrooms with an overall increase in average exam scores.

Faculty sponsor: Kari Stone

◆ Sajeel Latif

“Collective Action and Nonviolence Tactics Used by Farmworkers for Better Working Conditions”

The exploitation of farmworkers in the United States of America has been on full display throughout the nineteenth century. This presentation focuses on the importance of collective action and social solidarity amongst farmworkers in society over the last century, as well as the future role of collective action. In addition, this presentation will analyze whether a violent approach or a nonviolent approach proves to be most successful for farmworkers in their quest for equality. Through the analysis of different leaders and farmworker organizations, I argue that the use of collective action as well as a nonviolent approach towards those in power is imperative in order to make an everlasting and meaningful change for farmworkers.

Faculty sponsor: Rita George-Tvrtković

◆ Zakaria Malik

“The United States Should Rethink Its Drone Policy”

My oral presentation is to inform the audience that after deliberate research and analysis the United States should rethink its current predator drone policy with a macroperspective. The UN International Covenant on Civil and Political Rights states that every human has the right to live. Likewise, the International Committee of the Red Cross List of Customary Rules of International Law states combatants and civilians must be clearly differentiated at all times. However, Stanford and New York law schools have found that drone strikes lead to 49 civilian deaths for every one known terrorist, and drone strikes in Pakistan have killed thousands of innocent civilians. Also, drone strikes in Afghanistan and Pakistan are counterproductive as their inefficiency has resulted in more violence. For

example, a terrorist attack by the Taliban in Pakistan is more likely to occur five days after a drone strike. Instead of a reduction in terrorism, drone strikes are inciting hatred and revenge which results in more violence. Sources include the Bureau of Investigative Journalism, multiple major newspaper outlets, 2001 Authorization for Use of Military Force, Article 6, 51 of the UN Charter, Pew Center statistics, and interviews from soldiers operating predator drones.

Faculty sponsor: Rita George-Tvrtković

- ◆ **Varda Ahmed, Michelle Piasecki, Dominick Sarno**
“What Makes Art Appealing: A Study of Composition in Art”

Composition is “the organization of the formal elements in a work of art” (Sayre). A well-made composition in an art work will appeal to both a person with an art background and without, more so than an art work with a weak composition. In this study, a person qualifies as having an art background if he has taken an art class at the high school level or above, while one without an art background has either never taken an art class or has studied art only at the elementary or middle school level. The following four compositional theories have been studied to strengthen composition in art: (1) Golden Mean, (2) Rabatment, (3) Rule of Thirds, and (4) Harmonic Ratio. These compositional theories requiring planning are conducive to creating unity. Even though not directly visible to the human eye, compositions employing these theories often appeal to these audiences. An artwork with a weak composition is often unplanned and not unified, and therefore overlooked. The goal of this study is to discover if a well-made composition will actually appeal to all audiences or not.

Faculty sponsor: Jennifer Scavone

12:00-1:30 pm – Goodwin 321

- ◆ **Erin Davis, Francesca Guido, Eric Lukitsh, Ahmed Rizvi**
“Seven Farms™: Making a Private Brand Not So Private”

Since the recession that began in 2008, private brands have gained in popularity. For budgetary reasons, many consumers gave these brands a trial run and, eventually realizing the high quality of some of these brands, have continued to purchase them. At the same time, a number of consumers are increasingly demanding healthier fare, foods that are, for example, certified non-GMO, certified organic, and free of preservatives. Seven Farms™, Federated Group’s premium private brand, offers such benefits; however, this message has not yet been widely communicated to the targeted consumer segment. Seeking ideas for promoting Seven Farms™ like a national brand, SailPointe Creative, a division of Federated Group, approached students in the fall 2015 Promotional Strategy class. Utilizing integrated marketing communications (IMC) methods, teams of students developed creative concepts and tactics for promoting the brand, with the goal of elevating it to the consideration set for private brand retailers. This presentation will highlight portions of the campaign developed by one of those teams.

Faculty sponsor: Nona Jones

- ◆ **Francesca Guido, Erica Kotsovos, Eric Rubel**
“Demographic and Psychographic Variables as Predictors of Fine Crystal Purchases”

While the purchase of crystal products might normally be associated with special occasions like weddings, or perhaps with a certain age group, to be successful in the business, the sellers of such products need to know much more about a typical customer. As part of the College of Business Institute for Business Analytics and Visualization, a team of students undertook a project for a local small business, Crystal House, to help the owner gain a better understanding of potential customers in terms of who they are, where they purchase gift items, how much they typically spend, and the types of crystal products they purchase or may consider purchasing. Secondary and primary research the team conducted resulted in findings the owner can use to develop a more effective marketing strategy.

Faculty sponsor: Nona Jones

- ◆ **Greta Ciuksyte, Patrick Courteau, Dan Kersey, Jonathon Mueller**
“Freshmen Admission Process of Benedictine University”

We are using the business process modeling software ExtendSim to model the current state of the freshmen admissions process at Benedictine University. To do this we are using approximate statistics from the Benedictine University Admissions Department as well as statistics from the Benedictine University’s Admissions website. This information will be used to create an accurate model of the current-state admission process at Benedictine University. Using the business process model created for the Benedictine University admissions, we will be able to identify issues and inefficiencies in the process that slow down the system. With our findings, we will be able to create an efficient and effective future-state model with the ExtendSim software. This will allow us to make improvements on the system that could then be applied to the actual process used by the Benedictine Admissions team..

Faculty sponsor: Deborah Cernauskas

- ◆ **Brittany Brown, Louis Lopez, Brad Riva**
“Using ExtendSim to Model a Poorly Performing Car Wash and Improve It to Be More Efficient”

We are using the ExtendSim software to model a failing car wash and then remodel it to make it sustainable. The car wash we are modeling is located in St. Charles, Illinois. The car wash has been there since 2002 and has experienced a steady decline in profits over the last five years. The models will represent the car wash process and all of the activities, employees, and waiting lines associated with them. We will create the model based off of past data from the existing car wash. The improved model will run more efficiently and make more revenue than the old model.

Faculty sponsor: Deborah Cernauskas

1:30-3:00 pm – Goodwin 320

- ◆ **Nida Fatima**
“Zero-Valent Iron Nanoparticles to Treat Arsenic Contaminated Waters”

Nanoparticles are microscopic fragments measured from between 1-100 nanometers, with each type of nanoparticle differing in metal oxides. Nanoscale zero-valent iron particles (nZVI’s), or iron nanoparticles, have extraordinary adhesion and bioremediating properties with arsenic contamination in groundwater breaches. By allowing these molecules to work with absorbents and remediate arsenic in polluted waters, widespread populations suffering from tainted water-related diseases in southeastern countries have a chance for recovery. In this study, a double-series filter is used to strain and absorb arsenic from different groundwater samples. Water samples vary globally, and finding a system that works most effectively for a variety of water concentrations is necessary. Just as water samples can vary, arsenic concentrations can vary; thus, these are combatted with thicker layers of nZVI’s. By implementing two filters, therein two layers of adsorbents and iron nanoparticles, twice the amount of arsenic can be strained out. Such experimental results can prove to leave a positive correlation between survival rates among humans and increased percentages of arsenic-free water.

Faculty sponsor: Jean-Marie Kauth

- ◆ **David Hung**
“Understanding How the Undergraduate Student Learns Physiology”

Human Physiology is an integrative course drawing upon knowledge previously obtained in other courses such as biology, chemistry, and physics in hopes students can utilize information acquired in such areas of study and apply their understanding to a newer area of study, a course based on the systems and functions of the human body. The course is designed to encourage inductive reasoning on the part of the students. Therefore the traditional lecture-based course has been supplemented with discussion and activities to increase interaction. To gain insight into their thinking processes, students’ performance on the nervous and musculoskeletal unit were assessed to better understand the different misconceptions students may have and the way students arrive at those misconceptions. Throughout the course students were asked to respond at length to several class activities, exam questions, and

reflections. Student responses were collected and analyzed to better understand what students believe themselves to understand. It was found many students relied upon previous knowledge but failed to understand the proper way to integrate more recent knowledge to correct their misunderstandings.

Faculty sponsor: Allison Wilson

◆ **Dana Cairns**

“Phage Display Selection of a Linear Peptide for Binding to NeutrAvidin”

Through *in vitro* selection, linear peptides were selected for binding to NeutrAvidin (NA), a deglycosylated form of avidin which binds well to biotin. These selected peptides can be used as affinity purification tags for protein purification in addition to other biotechnology applications. Previous research identified a cyclic peptide, DRASPY, which exhibits excellent binding to NA. Phage display was used for the selection of linear peptides that bind well to NA. The initial library of linear peptides contained the DRASPY amino acid sequence and 8 randomized amino acid residues on the N-term. After phage display, selected peptides were competed against a non-binder and DRASPY for binding to NA in competition assays. Peptides that performed well in competitions were synthesized via SPPS and purified using HPLC. Purified peptides were then tested for direct binding to NA where they performed poorly when compared to the binding capability of HABA, a biotin-competitive dye. In an iterative process, a second library was created with 8 randomized amino acid positions on the C-term of DRASPY. Selection of library members has been completed; competition assays are currently being performed.

Faculty sponsor: Scott C. Meyer

◆ **Jonathan Bell**

“Manganese-Substituted Hemoproteins and DEPC Chemical Modification”

Hemoproteins can be replaced with a non-native metal or ring structure that enhances reactivity. This research focuses on the dioxygen storage hemoprotein myoglobin. Targeting the iron ion at the center of the heme and replacing it with manganese has introduced new oxidative capabilities. The transition metal manganese has defined oxidation states that can be easily probed by spectroscopy, and compared to its iron counterpart, manganese-myoglobin has increased reactivity. The distal histidine residue found in the heme of manganese-myoglobin is thought to play a role in its function as the distal histidine residue found in the heme of peroxidases is thought to participate in similar catalytic activities. Therefore, the distal histidine residue of manganese-myoglobin was chemically modified with diethylpyrocarbonate (DEPC), which shuts down proton transfer. Oxidation with the two-electron oxidant meta-chlorobenzoic acid (mCPBA) produces a metal-oxo intermediate that is reactive towards weak C—H bonds. Preliminary kinetic experiments monitored through UV/vis spectroscopy exhibit enhanced reactivity of the DEPC modified manganese-myoglobin compared to the unmodified version.

Faculty sponsor: Kari Stone

1:30-3:00 pm – Goodwin 321

◆ **Marko Saric**

“The Properties of Fractals, and Their Generation Using Iterated Function Systems”

Fractals are geometric objects which follow a certain rule or pattern infinitely. They were famously discussed in French mathematician Benoit Mandelbrot’s paper “How Long is the Coast of Britain?” in 1967. Fractals are examples of dynamical systems, which is a term used to describe any system or function that changes over time. These changes are seen in models for population growth and decay, finance, and meteorology. In this presentation, we will explore Mandelbrot’s paper. We will then discuss major characteristics of fractals, such as the fact that they cannot be defined well by area and perimeter like regular polygons can, and lastly we will explain how these objects can be generated using a computer system called Iterated Function Systems, or IFS.

Faculty sponsor: Manmohan Kaur

- ◆ **Kassandra Calendaria**

“A Comparison of Long-Term Viability of Annuals and Perennials”

Plants that reproduce once (annuals) and plants that reproduce more than once within their lifetimes (perennials) both exist in nature. The question is whether there are certain environments or cases in which annuals will be favored over perennials and what factors dictate this. For this work, numerous computer simulations were run based on a model taking both internal (e.g., growth rate) and external (environmental effects) effects into account on plant populations over multiple seasons. We will be discussing what was done with these simulations and our results, including in which cases annuals are favored over perennials (and vice versa).

Faculty sponsor: Anthony DeLegge

- ◆ **Antonio Marti Polo**

“SIR with non-linear pulse incidence rate and non-linear pulse vaccination”

We describe an SIR epidemic model with a nonlinear incidence rate and a nonlinear pulse vaccination strategy due to Zhao, Li, and Meng (2015). We prove the existence and global a. s. of the disease-free periodic solution.

Faculty sponsor: Timothy Comar

- ◆ **Ahmad Al-Tumizi, Mohammad Hamad, Azka Khan**

“Acoustic Properties of 3D Printed Seashells”

The main objective of our project is to print 3D artificial plastic seashells, and to analyze how the shape/size of the shell affects the acoustic properties of the shell’s cavity. We printed a variety of high quality seashells by adjusting only one parameter describing the shell’s shape, a “mouth size.” Based on the results from sound testing, we want to formulate a mathematical model, which would allow us to predict the acoustic properties of the shells as a function of their shape/size as defined by the “mouth size” parameter.

Faculty sponsor: Darya Aleinikava

3:00-4:30 pm – Goodwin 320

- ◆ **Marisol Cerrill, Brennan Paul**

“How Can a Component Manufacturer Diversify Its Customer Base and Grow Its Business?”

As part of the Institute for Business Analytics and Visualization, on behalf of Ballco Manufacturing and the company CEO, a team of students was commissioned to conduct research, specifically a sales opportunity analysis, to (1) estimate the demand in each of the company’s identified industries of interest and (2) develop an actionable marketing plan to address that demand. In this presentation, the team will discuss the secondary and primary research it conducted, as well as the marketing plan the team recommended based on the findings from this research.

Faculty sponsor: Nona Jones

- ◆ **Ugne Dinsmonaite**

“Surveying General Dentist Compliance on Using Technologies to Minimize Mercury Exposure”

Dental amalgams are made up of 50% mercury. This mercury is still being placed in patients’ teeth and removed daily. Mercury is considered hazardous waste, but it continues to leave dental offices, ending up in the water system through water lines and improper disposal methods. My proposed study would survey general dentists in Illinois on whether they use amalgam separators, filters, and/or recycle mercury. After a year I would resurvey the same dentists and see if my survey influenced their decision to acquire these technologies to minimize mercury waste. I hypothesize that there will be an increase in amalgam separators, filters, and/or recycling because my survey would bring awareness to this issue of mercury in the water systems and environment.

Faculty sponsor: Jean-Marie Kauth

- ◆ **Amanda Head**

“White Men Can’t Jump, but Can White Women? A Comprehensive Research-Based Analysis of Racial Stereotypes in Sport”

This presentation will report on the results found during my study of how the racial stereotypes about athletes are different for males and females. I will be specifically looking at the stereotypes of African Americans and of Caucasians in the United States in respect to the field of sport. The results will be concluded through a research study focused on the stereotypes of athletes among the general population as presented in the media. There will be a direct comparison to the racial stereotypes for men and women. I expect to find that there are less racial stereotypes for female athletes among the American public than there are for male athletes.

Faculty sponsor: Keith Mann

- ◆ **Kylie Hicks**

“Trans In the Public Eye: What Gender Dysphoria Is Versus How It’s Viewed”

With the growing presence of the transgender and transsexual community in the public eye, it can be somewhat difficult to decipher fact from fiction. Shows like *I Am Cait* and *I Am Jazz* and major films such as *The Danish Girl* have depicted specific cases of individuals living with gender dysphoria, however, some people gain all of their knowledge about the disorder through pop culture media such as this. This paper will discuss how gender dysphoria is defined in the professional community, how it presents itself, ways it can be dealt with in one’s daily life, and potential causes of the disorder. In concordance with what the disorder truly is, it will be discussed how the public views gender dysphoria, what it gets right and wrong, and problems that individuals with the disorder could face in society.

Faculty sponsor: Sandra Chmelir

3:00-4:30 pm – Goodwin 321

- ◆ **Jeremy Bingen**

“Sequence Enabled Reassembly (SEER) in Detecting DNA Modifications”

The goal of this research is to design a Sequence Enabled Reassembly (SEER) system using β -Lactamase to detect covalent DNA modifications in its native, double-stranded state. The SEER system we incorporated uses a split protein Biosensor to detect the presence of two DNA binding domains that only reassemble to a notable extent when the DNA binding domains are located on the DNA within several nucleotides of each respective binding domain. The objective of research done up until this point was to confirm our ability to replicate SEER systems reported previously and adapt SEER for detecting DNA modifications. Having replicated the SEER system successfully, current research focuses on covalently modifying DNA with Cisplatin to eventually use as a target for the SEER system. This Research has involved DNA synthesis, DNA sequencing, protein expression, and enzymatic assays using nitrocefin to test the SEER system, as well as, HPLC to test and purify covalently modified DNA. These processes ultimately culminated in the successful replication of the previously described SEER system. Troubleshooting is currently being run on the covalent modification of DNA procedure.

Faculty sponsor: Scott Meyer

- ◆ **Sally Jo Detloff, Tanushree Nair, Hafsa Sirajuddin**

“To Be or Not to Be ‘Reactive’: ROS and Pro-Inflammatory Cytokines as Key Instigators in the Bile Acid Response”

Gut homeostasis is maintained by tight regulation of the epithelial barrier and prolonged increase in paracellular permeability could initiate or exacerbate inflammatory bowel diseases. We had previously shown that chenodeoxycholic acid (CDCA), but not lithocholic acid (LCA), altered barrier function in T84 cells. Here, we show that the difference in CDCA-induced barrier dysfunction is due to the release of proinflammatory cytokine, IL-8. LCA reversed CDCA- and cytokine-induced release of IL-8. Increases in reactive oxygen species (ROS) have been suggested to release cytokines and is associated with inflammation. Therefore, we next determined if CDCA stimulated the release of ROS in T84 cells. H_2O_2 in the media was measured following incubation with cytokines \pm

CDCA, LCA or both. We found that CDCA and cytokines caused the most release of ROS and that LCA decreased the levels back to baseline. This suggests a role for ROS in bile acid induced tight junction-dysfunction. As a potential anti-oxidant and anti-inflammatory agent, LCA has the ability to enhance the barrier property of the epithelium and could be used to ameliorate inflammation-associated diarrhea.

Faculty sponsor: Jayashree Sarathy

◆ **John Doherty III**

“¹H-NMR and Computational Study of Solvent and Temperature Effects of Diketone Keto-Enol Tautomerization Equilibria Constants”

The temperature and solvent dependence of tautomerization equilibrium constants of several diketones are presented, where these systems have been examined using ¹H Nuclear Magnetic Resonance (NMR) spectroscopy. The NMR data are complemented by RM1 semi-empirical calculations of gas-phase electronic structure. The studies have given insight into the thermodynamics of the tautomerization process for diketone molecules.

Faculty sponsor: Tim Marin

◆ **Rushad Marfatia**

“Environmentally Benign Synthesis of Potential Antimalarial 1,2,4-Dioxazinanes”

One of the major frontline treatments for malaria is the endoperoxide-containing drug artemisinin. Its limited availability in underdeveloped countries and the potential for resistance by malarial parasites has created a demand for sustainable and economical syntheses of novel antimalarial drugs. 1,2,4-Dioxazinanes, containing an endoperoxide, were synthesized in high yields and high diastereoselectivity starting from aldehydes, amines, and peroxyquinols. The reaction conditions were optimized to limit environmental impact and improve efficiency by reducing the equivalents of imine, eliminating solvents and catalysts, and minimizing the number of purification steps. The proposed mechanism for this one-pot cascade reaction includes a catalyst-free intramolecular aza-Michael reaction as the key step. A small library of 1,2,4-dioxazinanes was synthesized for biological testing.

Faculty sponsor: David M. Rubush

4:30-5:30 pm – Goodwin 321

◆ **Luke Kendall**

“Carbon Sequestration in Boreal Tree Species: A Study in Greenhouse Gas Reduction”

The purpose of this proposal is to acquire money for research into carbon sequestration efficiency (CSE) for various species in boreal forests. This research will be conducted in multiple locations throughout the Boreal Forest Region of Canada over ten years in order to get an idea of how age impacts the CSE in each tree type. Soil samples will be gathered yearly from multiple species of coniferous tree, and will be tested in the lab for carbon content using dry combustion. This will reveal both the difference in CSE in each of the species, and will also provide a basis for thought about the change in CSE over time. This experiment will be completed using only samples of Canadian boreal soil, and so can be followed up by similar experiments in differing regions. This will provide a well-rounded idea of the CSE throughout the world. Results obtained in this experiment will be important in the discussion of global climate change (GCC), as it will allow groups with interest in planting trees to be used as carbon sinks to more effectively use their time and resources. By planting trees that have high CSE, humans will be able to have a greater impact in reducing the devastation of GCC.

Faculty sponsor: Jean-Marie Kauth

◆ **Trupti Potdukhe**

“Evaluating the Epidemic of Coral Bleaching and Its Effect on the World in the Year 2050”

With the recent breakthroughs made in climate change, scientists have discovered that coral bleaching being one of the most detrimental global threats to our oceanic ecosystem. As changes in the environment occur, the coral get stressed causing them to secrete the symbiotic algae needed for cellular processes, resulting in a white-looking or

“bleached” coral. Stimuli that would cause coral bleaching include high temperatures, carbon dioxide concentrations (not only from greenhouse gas emissions, but also from the organisms that coexist with the coral), and ocean acidification. In this proposal, the effect these stressors on the coral will be evaluated. Similarly, discussion will also focus on the effect of coral bleaching on the ecosystem as a whole, as well as how the human race will play a role in global climate change.

Faculty sponsor: Jean-Marie Kauth

◆ **Jermeen El-Zabet**

“The Effect of L.A.-Mediated Help Sessions on the Performance of Students on Cell Biology Exams”

Exams in the science field aim to assess whether or not students understand the material and can apply it to new situations. Therefore, the level of questions on science exams goes beyond the scope of recalling facts and explaining the known and the obvious. We believe that students would do better on exams if they spent time engaging with the material and making content-based connections. In this study, students who received a grade of 75% or less on their first cell biology exam were given the opportunity to attend at least three out of four content-based help sessions led by the Learning Assistant (L.A.) to be able to earn a higher score on their second examination. We expect that students who attend and actively engage in help sessions are more likely to perform better on their second exams compared to their first exams.

Faculty sponsor: Allison Wilson