URSA

Undergraduate, Research,

Scholarship and Arts.

Benedictine University

Oral Presentation Program

April 14, 2022 ❖ 12:00-4:30 pm ❖ Goodwin Hall 313 and 321

SESSION 1: Goodwin 313 (12:00-1:30 pm)

◆ **"Simson's Theorem and Morley's Theorem"**
Haris Mohammed

Simson's Theorem and Morley's Theorem are two classical theorems in Euclidean geometry. Simson's Theorem states that a point is on the circumscribed circle of a triangle if and only if the feet of the perpendiculars from the point to the sides lines of the triangle are collinear. Morley's Theorem states that a certain triangle formed by the intersection of the angle trisectors of a given triangle is equilateral. We will give proofs for these theorems, illustrating our results using GeoGebra.
Faculty sponsor: Tim Comar

◆ **"Desargues's Theorem in the High School Classroom"**
Caroline Caesar

Desargues's Theorem states that two triangles are perspective from a point if and only if they are perspective from a line. This theorem has significant applications in the theory of perspective drawing. We present a proof of this result and then introduce a lesson for a high school geometry class on applying this theorem using GeoGebra.
Faculty sponsor: Tim Comar

◆ **"Properties of The Nine-Point Circle"**
Jack Lyons

For any triangle, the midpoints of each of the sides of the triangle, the foot of each altitude, and the midpoints of the line segments joining each vertex to its orthocenter lie on a circle called the nine-point circle. We first present a proof of this result and then present proofs of the Nine-Point Center Theorem, which states that the center of the nine-point circle is the midpoint of the segment from the circumcenter to the orthocenter, and Feuerbach's Theorem, which states that the nine-point circle is tangent to each of the four equicircles.
Faculty sponsor: Tim Comar

SESSION 2: Goodwin 321 (12:00-1:30 pm)

◆ **"The Synthesis of a Family of Lawsoniaside Molecules"**
Zahra Irfan

The henna plant, *Lawsonia inermis*, is commonly used as an organic dye to tint the skin and hair a reddish-brown

color. Henna contains many constituents, where its main dying compound is a naphthoquinone called lawsone (2-hydroxy-1,4-naphthoquinone). Another component of henna dye is lawsoniaside, which is a naphthoquinone that resembles lawsone except for the addition of two glucose residues. This research aims to synthesize lawsoniaside and a family of related glycosidic derivatives which have different sugars. The proposed strategy begins with the protection of the enol of lawsone with a protecting group, followed by a reduction of the whole molecule. Glycosylation adds two equivalents of sugar, then a deprotection removes the protecting group to yield the glycosylated lawsone product. Since lawsoniaside has been reported to show pharmacological properties, biological testing of this family of compounds is a future direction.
Faculty sponsor: Casey Larsen

◆ **"Design and Testing of A Portable Standalone Solar-PV System"**
Anna Khalid, Arman Svoboda

The use of solar-photovoltaic technology (solar-PV), which converts sunlight into electrical energy, is becoming increasingly common as people around the world switch to solar-PV as a main source of electricity for their homes and businesses. Unlike power from a utility grid run by different companies that charge monthly bills, solar-PV generates stable energy free of market fluctuations and unfavorable geopolitical developments. This project focused on developing a standalone solar-PV system at BenU that would demonstrate the solar to electrical energy conversion, as well as the function and interconnection of the solar panels, the inverter, the battery, and the charge controller. The solar panels operate based on the photovoltaic effect, which directly converts sunlight into electrical energy. The battery stores this energy under constant surveillance from the charge controller, which acts as the battery doctor, preventing the battery from deep discharging and overcharging. The panels generate a DC-current which is stored in the battery and then converted by the inverter into AC-current for use in most conventional applications and loads. The system was placed in different locations to study its performance as a function of the solar insolation and the tilting angle. An industrial battery tester was used to measure the battery capacity which directly measures generated current. Experiments were performed under varying insolation, both on cloudy days and on sunny days when the system operates at maximum efficiency. The solar panels were designed for a variable tilt to enable study of current generation as a function of the geographic location of similar portable systems.
Faculty sponsor: Stefan Stefanoski

◆ **"An Introduction to Zero-Knowledge Proof Systems"**
Dylan Pfieffer, Robert Dudzinski

Zero-Knowledge Proofs are used to convey that a critical piece of information is known to a person or company without revealing the information itself to another person or company. This research explains the mathematical and computer processes involved in Zero-Knowledge Proofs while providing interactive and non-interactive examples to demonstrate these processes. The importance and method of these proofs will be understood as a result of this research. This research is an extension of work undertaken in our Cryptology class.
Faculty sponsor: Manmohan Kaur

SESSION 3: Goodwin 313 (1:30-3:00 pm)

◆ **"Being-Towards-Ecoapocalypse: Climate Change as Hyperobject"**
Seth Hopkins

The subject of climate change is one being approached with an outdated "philosophical toolkit" and we cannot afford to approach it as such. The nature of climate change (CC) is such that its motions and effects extend throughout time and space: it is an entity whose being spans the globe, it affects many places quite apparently and in others seems withdrawn. One cannot look out the window and witness climate change; instead, one must have an expansive historical and quantifiable scientific context, and only when this unimaginably huge assortment of phenomena is mapped out does this strange object emerge: a hyperobject. Hyperobjects are entities made apparent

in the work of object-oriented ontology, which by their nature seem to render traditional ontology of treating subjects and objects as atomized, isolated existences useless and in turn diminish the dominance of the subject had and grant objects a radical degree of relevance and influence before left unconsidered. My work aims to highlight how this new contextualizing of CC is not only necessary, but invariably occurs in our approach to it and the implications this immensely disruptive notion holds for philosophy, culture, ethics, and aesthetics.
Faculty sponsor: Martin Tracey

- **"A Need for a Constitutional Monarchy in Times of National Disunity"**
  Zohaib Farooq

  Baron de Montesquieu's writings and defense of his views on government are some of the earliest influences on the revolutionaries in France and on the framers of the U.S. Constitution. He says that the best form of government is one that has all three forms of power—legislative, executive, and judiciary—and that abide by the principle of check to power. While Montesquieu favors a republican form of government, he does not appreciate the values of a constitutional monarchy. National disunity is a problem for republics. In a republican form of government, virtue is best because people's first obligation is to the community and preservation to the government. However, in s national disunity there will be a lack of agreement among people which prevents them from working together effectively. Consequently, a monarch is needed to get to a national unity where all citizens are sharing and working together for the collective good to be guided in the right direction. In this paper, I specifically focus on how a constitutional monarchy may work in times of national disunity.
  Faculty sponsor: Steven Burgess

- **"Race, Gender and Voter Evaluations in Local Political Campaigns"**
  Adrian Castaneda

  This project aims to determine if there is racial or gender bias in the ways voters evaluate candidates in local political campaigns. Political scientists have been studying the impact of candidate race and gender on voter preferences for decades. Much of this research has revealed that the race and gender of candidates can influence the ways people evaluate candidates. To study the influence of race and gender on voters' evaluations of candidates, I developed a prototyped campaign mailer, with manipulated presentations of candidates' gender and race, for use in an experimental design. All other content of the mailer remained the same: female candidates had the same name, Wendy Miller, as did the male candidates, William Miller. The description of issue positions, color scheme, layout and all other details on the mailer were held steady throughout the experiment. The distribution of the manipulated campaign prototype literature was randomized so that participating subjects (Benedictine University students) all had the same opportunity to view one of the eight prototypes. A survey instrument was used following exposure to the "treatment" in order to measure voters' attitudes about the fictional local candidates.
  Faculty sponsor: Phil Hardy

SESSION 4: Goodwin 321 (1:30-3:00 pm)

- **"Predictive Hockey Analytics Using Hypothesis Testing"**
  Alia Alramahi, Robert Dudzinski

  Predicting the outcome of a hockey game can be challenging due to the fast paced and physical nature of the sport. In this talk, we share one such approach for determining the outcomes of NHL hockey games. Our analysis technique uses hypothesis testing to determine whether variables (or combinations of these variables) like shot differential, manpower differential, face-off win percentages, the amount of time in power plays, and the number of low, medium, or high-danger shots are predictive in determining the outcome of NHL hockey games. We attempt to use the information gathered to construct a model that predicts whether a team is likely to win their next game given what has occurred in prior games. This research is funded by a grant from the Center for Undergraduate Research in Mathematics (CURM) and includes student participants from both Benedictine and Lewis Universities.
  Faculty sponsor: Anthony DeLegge

- **"Digital Signatures and its Cryptanalysis"**
  Haris Mohammed, Zainab Taqi

  In today's digital world, financial, socio-political and personal interactions all happen across the cyberspace. Increasingly, paper documents are going away and are replaced by computer files which are sent through an insecure internet. Digital signature is an electronic signature that is used to authenticate the identity of the sender of the message or the signer of the document when it is sent over the internet. In this project we will outline the RSA signature and explain how hash functions are used in their implementations. Specifically, we will describe how hash functions are used to encrypt messages to prevent forgeries.
  Faculty sponsor: Manmohan Kaur

- **"Pilot Study on the Effect of Captive Conditions on Gorilla Cranial Morphology"**
  Asbah Moosani

  In this pilot study, we characterized cranial morphology in wild gorillas (*Gorilla gorilla gorilla*, *Gorilla beringei*, and *Gorilla gorilla diehli*) for comparison to a captive gorilla named Bushman. I placed 10 craniofacial landmarks on 12 crania and used two multivariate techniques, Procrustes superimposition and Principal Coordinates Analysis (PCA), to characterize size and shape differences in these gorilla crania. The preliminary results were promising, indicating a difference in Bushman's cranium compared to the crania of wild gorillas, but more research needs to be done using a full set of cranial landmarks on a larger sample of gorillas
  Faculty sponsor: Robert McCarthy

SESSION 5: Goodwin 313 (3:00-4:30 pm)

- **"'Oppressed with Melancholy': Humoral Theory in the Sonnets of William Shakespeare"**
  Cole Olson

  This paper examines how Shakespeare's sonnets allude to humorism, which identified blood, black bile, yellow bile, and phlegm as vital bodily fluids. Developed by the ancient Greeks for medical purposes, humoral theory associated these bodily fluids with the elements, temperament, and other qualities. While these ideas were beginning to lose credibility in the medical field by the late Elizabethan period, they were nevertheless often adopted by artists and authors as a representational strategy. In this presentation, I discuss how Shakespeare's sonnets develop rich descriptions of figures in the poetry through such invocations of humoral theory.
  Faculty sponsor: Zubair S. Amir

- **"'Whole Intellects Disgorged in Total Recall for Seven Days and Nights': Day and Night in the Poetry of Allen Ginsberg"**
  Griffin Gletty

  In this paper, I examine the representation of day and night in the works of Allen Ginsberg, specifically his poem *Howl*. As in a number of his other works, *Howl* demonstrates how Ginsberg imagines night as the scene for America, rarely alluding to day in the poem and even then often only in relation to nighttime. I explore the significance of these allusions to the night, both in the stories he tells and in the vision of America depicted in the poem.
  Faculty sponsor: Zubair S. Amir

SESSION 6: Goodwin 321 (3:00-4:30 pm)

- **"Stereotyped Images of Women in Current Magazine Advertising"**
  Ilse Cowan

  In *The Four Women of the Apocalypse*, Marian MacCurdy identified four archetypes of women dominant in Christian literature and arts in the Middle Ages and that are still dominant today in the advertising page: the Mother, the

Courtly Lady, the Temptress, and the Sex Object. My research explores how these archetypes continue to be glamorized in advertising and inserted into the subconscious, in turning reveal how women are viewed from a male perspective. Using current magazines targeted to women, such as People, Cosmopolitan, and Good Housekeeping, I will examine four images that correspond to each of the archetypes described by MacCurdy. In Mother advertisements, women appear modest and pure, usually making dinner, with their children and husband, or doing household activities. Courtly Lady advertisements will usually show an unbothered woman who is distracted and ignoring a desire from someone else. The figure of the Temptress in advertising is usually a provocative woman promoting bad decisions. Lastly, the Sex Object usually appears in revealing clothing and is submissive to another man or to the audience. Finally, I will discuss how the male gaze detrimentally conditions women.
Faculty sponsor: Luigi Manca

- ◆ **"An Analysis of Nora Ephron's Wellesley Commencement Speech"**
  Afnaan Syed

  In this project, I examine the commencement speech delivered by Nora Ephron to Wellesley College's class of 1997. In the three decades since her own graduation in 1963, Ephron was able to see significant changes in views of women's higher education. My analysis discusses the women's liberation movement in the 1960s and 1970s and explores the use of rhetoric used in the speech. The incorporation of ethos, pathos, and logos gives a compelling view of how much society has changed through the civil rights movements in the 1960s, notably in the much-needed inclusion of women from different backgrounds in institutions of higher education.
  Faculty sponsor: Luigi Manca

- ◆ **"An Analysis of John F. Kennedy's 'Report to the American People on Civil Rights'"**
  Alexandra Skokos, Christine Thomas, Syeda Adeena Ahmed, Maheen Mohammed

  In this presentation, we analyze President John F. Kennedy's 1963 "Report to the American People on Civil Rights." In this Cold War-era televised address, Kennedy employed a field of rhetoric to articulate his stance on the Civil Rights Movement. He was advised not to present a speech among heightened tensions as the effort would be deemed ineffective. Nevertheless, he vocalized the rights of all Americans and began healing racial division within the country. Since he knew that the black vote had been integral in electing him president, Kennedy made passing the Civil Rights Act a priority in his political agenda. Three aspects of rhetoric were applied in his address: ethos, logos, and pathos. Kennedy utilized a variety of statistics and facts to influence his audience through logic. Proving his credibility, he spoke in his own words, allowing for a personal connection to the country. To appeal to the emotional side of the audience, Kennedy highlighted the privileges of white Americans, comparing it to the hardships of black individuals.
  Faculty sponsor: Luigi Manca

- ◆ **"An Analysis of Martin Luther King's 'I Have a Dream' Speech"**
  Sarina Shahid, Salva Baig, Isra Zuberi

  This presentation offers an analysis of Martin Luther King's well-known "I Have a Dream" speech, which was delivered to nearly 200,000 people near the Lincoln Memorial in Washington, DC, on August 28th, 1963. It had been over a century since the Emancipation Proclamation was signed to end all slavery in America, but even though Black Americans were theoretically free they had "chains of discrimination." King's speech played an important role in the passage of the 1964 Civil Rights Act by drawing the attention of the American public to racial inequality and advocating against racial discrimination. Our discussion of the speech will include an examination of ethos, pathos, and logos.
  Faculty sponsor: Luigi Manca