STUDENT
UNDERGRADUATE
RESEARCH
FESTIVAL

April 18, 2013
STUDENT UNDERGRADUATE RESEARCH FESTIVAL

Carroll MONTANA

April 18, 2013
Acknowledgments

Here we are, exactly a year after our inaugural Carroll College Student Undergraduate Research Festival. This year we build upon the success and excitement of last year’s festival, and we now have 45 presentations, posters, and roundtable discussions. Once again, I would like to thank Dr. Brandon Sheafor for providing the passion and enthusiasm to make this event a Carroll tradition. Ms. Shanni Barry served as our logistical mastermind—collecting titles and abstracts and creating our schedule of talks. Dr. Jeannette Fregulia provided planning guidance, and Sarah Windmueller found space for our sessions. Ms. Laura Ottoson again lent her impeccable design and layout skills for this booklet. This event continues to be a success because of the faculty who nominate students and mentor them through their research experiences. We would lack an audience for these presentations without the cooperation of faculty who released their students from this afternoon’s classes. Finally, a huge thank you to our student presenters: you make this happen, and the Carroll community celebrates your accomplishments.

—Mark Parker, PhD
Associate Dean of Academics
Chris Axtman and Megan Towles

A Gendered Analysis of Forensics Evaluation: A Case Study of a Forensics Tournament

Faculty Sponsor: Charlotte Jones  Presentation

In high school as well as in many colleges, debate remains an inherently communication-centered activity. While there might be masculine and feminine styles of communication, the success rates of these two are not necessarily equal. Traditionally, scholars have identified gender bias in debate success (e.g. Millsap & Millsap, 2006). In this paper we analyze debate performance at a statewide high school debate tournament hosted by a liberal arts college in Montana. We utilized the evaluation measures used by judges in order to identify the top individual speakers and teams. We performed a statistical analysis of the success of men and women in Lincoln-Douglas and Policy as well as in a single all-inclusive division in Public Forum. Each of these styles has its own unique culture, structure and style of performance. The analysis reveals a potential bias still present in the debate community today. We discuss the apparent gendered discrepancy in evaluations, and draw on scholarly literature in this area in discussing potential explanations for the discrepancy between the competitors’ gender and evaluation of their performance.
Elizabeth Baker

**Children’s Lives Under Occupation: World War II in France, 1940–1944**

*Faculty Sponsor: Jeanette Fregulia  Presentation*

Until recently historians have largely overlooked the experiences of children in wartime. Through a case study of the German occupation of France during World War II this paper argues that children are not simply passive observers of war, but rather, active participants greatly affected by the events going on around them. A study of first hand sources including diaries and memoirs of multiple children throughout France, reveals that children are often affected both physically and psychologically equal to or greater than that of adults who have lived through the same events. While a number of factors including age, ethnicity, location, sex, and social class all influenced children’s experiences during the war, certain facets of life were similar everywhere. Going to school, combatting hunger, and interacting with the occupying forces were all unavoidable aspects of life under occupation. Though young and often unable to fully comprehend the events going on around them, children's lives were undoubtedly influenced and shaped by their experiences during wartime and occupation. This case study of France during World War II acknowledges the importance of children's stories to wartime history, and concludes that without this record the history remains incomplete.

Mary Beall

**An Examination of Freedom and Gender**

*Faculty Sponsor: Elvira Roncalli  Presentation*

The separatist feminist movement exemplifies an ideology in which individuals thought that to escape the chains of society one must exit society. The separatist movement did not result in the reduction of societal constraints and shows that
another method must be pursued. Gender conformity is a system that plagues societies across the globe. This system prevents individuals from living freely by forcing their compliance to established norms. Simone De Beauvoir and Hannah Arendt provide compelling thoughts on how individuals can disclose themselves freely while creating an opportunity for others to move towards freedom. Within society many forms of oppression exist; however, gender conformity is one of the most egregious systems. For freedom to be possible, gender conformity must be dispelled within society.

Jessica Belisle
Co-Directing the Carroll College Theatre for Children production of Robin Hood

Faculty Sponsor: Chuck Driscoll

Laura Berguer
Liberal Arts Education and the Environment

Faculty Sponsor: Kay Satre

Max Bernt
Blood Feeding Behavior of Culex tarsalis at Medicine Lake National Wildlife Refuge, Montana

Faculty Sponsor: Grant Hokit

It is known that the ornithophillic mosquito, Culex tarsalis is the primary vector of West Nile Virus (WNV) in Montana. An analysis of this mosquito’s blood feeding behavior allows researchers to identify preferred hosts and to determine the rate at which this species parasitizes humans and other
tangential hosts. Additionally, an understanding of blood feeding behavior allows an assessment of WNV risk based on the regional availability of preferred hosts and the hosts’ competency in viral amplification. In this study, blood engorged Cx. tarsalis were captured at Medicine Lake National Wildlife Refuge over three weeks in early, middle, and late summer. Vertebrate DNA was isolated from mosquito blood meals and a fragment of the COI gene was PCR amplified to determine host species. Additionally, avian surveys were conducted at mosquito collection sites so that each bird’s relative abundance could be compared to its incidence in blood meals. The two most common host species were the Mourning Dove comprising 59% of blood meals and the American Robin comprising 33%. These species were ranked 4th and 14th, respectively in observed abundance out of the 47 species counted in this study. These results suggest that Cx. tarsalis at Medicine Lake NWR exhibits a feeding preference for these two species.

Jena Boehnke and Katie Cummings
Queens of Comedy: The Portrayal of Gay Men in Network Scripted Television Shows

Faculty Sponsor: Charlotte Jones  Presentation

In recent years the presence of gay men in mass media has grown significantly, especially in comedy television (Tropiano 2002): from Will and Grace, one of the first TV shows to have lead gay characters in the 1990s, to the present day in which shows such as Modern Family and Glee feature gay lead characters. On one hand, this trend indicates that there is a growing acceptance of gay lifestyles among the American TV viewing public. On the other hand, portrayal of gay men is marked in that characters are portrayed at times with exaggerated feminine traits. We also show that scripted TV programs with multiple male
lead characters are trending toward separating characters into masculine and feminine types or categories, instead of showing a spectrum. In this manner, types related to gay characters have not changed as much as the trend toward increased gay male presence would indicate. In fact, even “masculine” homosexual characters tend to have more feminine traits than masculine traits, such as being melodramatic, bitchy and fussy. In this paper we examine both the mainstreaming effect that has resulted in increased acceptance, and continued marking and typing of gay male characters.

Nicole Broden

Investigating the electrophilicity of Cu-bound nitriles: Toward a method for [2+2+2] cyclizations

Faculty Sponsor: Colin Thomas Poster

Several copper nitrile systems were explored to determine the change in nitrile nucleophilicity upon coordination to copper. Complexes bearing electron-withdrawing nitriles and electron-donating nitriles were analyzed using FTIR spectroscopy. These results are being applied to determining conditions suitable for nitrile cyclotrimerization to generate triazines. Such a synthesis would provide a cheap and sustainable alternative transition metal for promoting cyclotrimerization reactions than is currently available.
Marcus Brouwers  
**Scenic Design for the Carroll College Theatre for Children production of Robin Hood**

*Faculty Sponsor: Chuck Driscoll  Presentation*

For my presentation I would like to explain the research behind the construction and design choices of the set style of the Carroll College Theater performance of Robin Hood. This requires knowledge of the target audience of a children’s show, research into the time-period appropriate architectural style the middle-ages, production management of the carpentry, and preparation in the actual building process. Through reading the script, studying the potential design requirements, drafting the set and finally building the set, a proper theatrical show can be performed.

Jonathon Butler  
**Correlational Analysis of Religiosity, Locus of Control, Anxiety, and Risk Prone Behavior**

*Faculty Sponsor: Chris Collins  Presentation*

This study examined the relationships between, religiosity, perceived locus of control, anxiety, and risk prone behavior. Locus of control (LOC) is defined as how an individual assigns control of life events; either internally (under individual control) or externally (controlled by external factors). Previous research has indicated that individuals who have a high level of religiosity are less likely to engage in risky behavior than individuals who have a low level of religiosity (Adams, 2000). Previous studies have also indicated a negative correlation between religiosity and anxiety. Participants in the current study participated via an online survey. The survey was comprised of measures regarding religiosity, locus of control, anxiety, and risk.
prone behavior. It was hypothesized that religiosity would correlate negatively with internal loci of control, anxiety, and risk prone behavior. Pearson’s r correlational analyses were conducted on all the variables. A significant positive correlation was observed between highly ritualistic religious practices and a perceived internal locus of control (p < .05) as well as a significant positive correlation between a greater external locus of control based on powerful others and higher self-reported anxiety (p < .05). However, all other correlations were not statistically significant. Implications of these findings as well as future research directions are also addressed.

Mattie Casey

Microsatellite Analysis of Gene Flow between *Culex tarsalis* Populations Connected by Irrigation in Yellowstone County, Montana

Faculty Sponsor: Jennifer Geiger Presentation

The purpose of this study is to determine whether population connectivity by irrigation enhances gene flow between *Culex tarsalis* populations in the state of Montana. Four populations of *Cx. tarsalis* were collected along the Yellowstone and Bighorn rivers and allele frequencies obtained from PCR amplification of five microsatellite loci, visualized using the QIAxcel Advanced System, were used to assess the genetic structure of the populations. Results of two loci indicate lower pairwise $F_{st}$ values between populations connected through irrigation as well as between populations connected by waterway. If the genetic similarity between these populations reflects rates of gene flow, these results suggest that higher degrees of gene flow may not be due to irrigation but rather to connectivity by any waterway. Further analysis of additional polymorphic microsatellite loci needs
to be performed to determine if a higher degree of gene flow does indeed occur between these populations.

Patti Casne

**Brides Go West: Photographs and Letters Engage Lovers**

*Faculty Sponsor: Jeanette Fregulia  Presentation*

In pursuit of an historical understanding of the influence of the picture bride on the settlement of the American West, this paper examines the journey of four brides: Rachel Bella Kahn, Elizabeth Chester, Shidzuyo Miyake, and Flora Lee. The experiences of these brides provide the historian with a personal glimpse into the challenges and joys of the frontier life on the plains and prairies of the West in America from the mid-to-late 1800s to the mid-1900s. While men traveled West in search of gold and free land under a series of Homestead Acts beginning in 1862, women sought a new life in the West for many reasons from adventure to a desire to escape the dismal prospect of spinsterhood. These women changed the West by their tenacity and grit. The history of men who expanded the nation from the Atlantic to the Pacific with a grid of homesteads, ranches, mining settlements and small towns is well documented. The contributions of the women who responded to the marriage proposals of these men have gone virtually undocumented. Using diaries, letters, autobiographies, interviews, photographs and extensive secondary sources, this paper argues that the picture bride left a unique historical record of the hardships and rewards of following the dream to go West.
Maegen Cook

Irish Traditions in Butte through Pubs, Song, and Dance: 1890s–1930s

Faculty Sponsor: Jeanette Fregulia  Presentation

This research paper examines the impact of Irish tradition in Butte, Montana, between the 1890s and 1930s. Home to the highest percentage of Irish immigrants in the U.S. at that time, the new arrivals made their culture evident throughout the mining community. The immigrants brought with them their pub culture, songs, and dances. My research examines the numerous pubs and breweries in Butte and their role in unifying the Irish immigrants due to their affinity for drinking and socialization. Pubs and sponsored events throughout Butte prompted the inclusion of traditional Irish songs and dances. In order to understand Butte's pub culture, I address the origins of drinking in Irish culture and the importance of alcohol, especially whiskey, to the Irish people. Such importance led to a shared cultural identity that immigrants clung to and brought with them to their new home in Butte. I also focus on the presence of Irish clubs in Butte (the Ancient Order of Hibernians, the Robert Emmet Literary Association, and the Gaelic League) and how the clubs created events and other means to unify the Irish population. Based on a variety of sources including various books, journals, and newspapers, my research argues that the Irish population in Butte maintained their Irish culture through pubs, song, and dance to reminisce on their culture and maintain their identity, which was central to the life they knew before immigration, and they believed it was important to keep their cultural roots alive through the generations that followed.
Darla Dexter

**Late Holocene Plant Use at the Beaver Creek Rock Shelter, Southwestern Montana**

*Faculty Sponsor: Lauri Travis  Poster*

The 2011 Carroll College Archaeological Field School conducted an exploratory excavation within the Beaver Creek Rock Shelter in southwestern Montana. The Beaver Creek Rock Shelter exposed four cultural occupation layers dating to over 2,500 years ago. Pollen retrieved from the paleoenvironmental record included a wide variety of plants. The pollen also revealed seven plant families that were found exclusively in three of the occupation layers. This research reviewed traditional Native American ethnobotanical uses of the seven plant families. The findings show the seven plant families were used primarily for medicinal purposes. Although archaeologists have traditionally viewed botanical remains as evidence of prehistoric subsistence, this research demonstrates archaeologists’ need to use caution in assuming plant remains in the archaeological record are predominately tied to subsistence.

Ben Donner

**The Paris Commune of 1871 and Its Impact on the Formation of Anti-Communism in American Society**

*Faculty Sponsor: Jeanette Fregulia  Presentation*

This paper argues that the Paris Commune of 1871 provided the beginning of anticommunist sentiment among the American people. Using official American government correspondence and American newspaper articles from across the country, I argue that the foundations for American anti-communism lie in the slanted journalism and skewed reports that Americans were reading.
From the very beginning of the Commune, reports coming from Paris negatively portrayed the Commune to the American people, major newspapers, including the New York World and the New York Tribune, ran scathing articles accusing the Commune of violent acts. At the same time, newspapers remained eerily quiet in May during the Bloody Week, when thousands of Communards were murdered as the French government retook the city, an indication of the truly slanted nature of the reporting. I also provide evidence that during the remainder of the nineteenth century, the Commune continued to be portrayed negatively by the American press who sought to influence public sentiment against the rise of Communism using the Commune. This paper concludes with an analysis of the effect slanted news reporting had on anti-communist sentiment in the United States, a half century before the Bolshevik revolution in Russia.

Paige Esposito


Faculty Sponsor: Sam Alvey
Presentation

In order to contribute to knowledge of Cache Valley Virus, a virus that causes ovine fetal malformations and stillbirths, this study conducted a survey of six mosquito species in three Northwestern states to determine the primary vector of the virus. Total RNA was extracted from mosquito samples and subjected to reverse transcription PCR to determine if viral RNA was present. Of the 369 samples tested, none tested positive for viral RNA. This outcome indicates that the virus may be present at low levels or may be carried by another insect. An increase in sample size may also be necessary to detect the presence of the virus.
Kaitlyn Holyfield

The effects of chytridiomycosis on myocardial oxygenation in the Columbia spotted frog, *Rana luteiventris*

Faculty Sponsor: Brandon Sheafor

Poster

Chytridiomycosis is a skin infection caused by the fungus *Batrachochytrium dendrobatidis* and has been responsible for world-wide amphibian declines. However, there is currently no clear explanation of how this infection is killing amphibians. I hypothesize that the fungus is preventing effective cutaneous gas exchange, causing hypoxia in the heart which could lead to myocardial ischemia. The objectives of this study are to find an organism that is susceptible to chytridiomycosis which can be used as a model for detecting myocardial ischemia in frogs, establish a protocol for ischemia detection, and determine if there is a correlation between chytridiomycosis and myocardial damage.

Columbia Spotted frogs (*Rana luteiventris*) were collected and swabbed from Park Lake and Krohn Lake in Montana. Of the 23 total frogs sampled, two from Park Lake and one from Krohn Lake tested positive for *B. dendrobatidis* according to a Taqman quantitative PCR assay. Captive *R. luteiventris* inoculated with the fungus showed signs of infection. Blood and heart tissue samples were homogenized, run out on a 10% polyacrylamide native gel and stained for LDH activity. These gels showed five bands that correspond to the five LDH isoforms. The relative strengths of the LDH-1 and LDH-2 bands can indicate if myocardial damage has occurred. In conclusion, the presence of chytridiomycosis in wild-caught amphibians suggests it is a growing problem in Montana. The Columbia Spotted frog is susceptible to chytridiomycosis and can serve as a model organism for further study. The established protocol using LDH isoenzyme native gel shows promise of being an effective method of accessing amphibian myocardial damage.
This research study set out to determine the prevalence of political bias in the mass media. The study focused on three major news networks, CNN, Fox News, and NBC News. Our hypothesis was that 1. Fox News stories are more likely to have a political right slant. 2. NBC News stories are more likely to have a political left slant. 3. CNN’s stories will be primarily neutral, but are likely to have a left slant. Data was collected using a content analysis over a 10-day period, with news collected from the websites of the three news sources. Network news stories from the websites of these news sources were recorded for ten weekdays. The date range of this study covers both pre and post general election in the United States. The top three stories presented on each of these three news websites were analyzed daily. We tallied the number of times Barack Obama, Mitt Romney, Democrat, Republican, or another political figure was mentioned. This provided our quantitative data to assess the coverage given to the candidates and political parties presented in these network news stories. Valence was included in our study to assess the political preferences in regards to the way news is framed. We assessed the frames and valence by analyzing both the content and the context in which the reference was made, using three scale levels: positive, neutral, and negative. The primary theories utilized, that are recurrent in the mass media, were agenda setting, gatekeeping, and framing. The results of our study demonstrated a definite political bias in written feature news stories.
Chris Kiefer  
**Aerodynamics—Computer Run-Time Comparisons of Three CFD Models**  
*Faculty Sponsor: John Scharf  Presentation*

During my internship at Lockheed Martin last summer I worked in the Aerodynamics Center of Excellence. I was assigned the task to investigate the accuracy of solutions and the time it takes to obtain solutions using three different types of computational fluid dynamic (CFD) models. Lockheed Martin has mastered the modeling of flow patterns around aerodynamic vehicles, but things get more complicated when blunt objects are introduced into the models. Blunt objects create complex flow patterns that cannot be modeled accurately using steady state solutions. The more intricate models are capable of providing accurate solutions, but they take much longer to run. It is important for Lockheed to know how much these more accurate models were costing them in solving time. Time is money and if a sufficiently accurate answer can be found using a simpler solver then that is the preferred option. I created geometry that represented a simplified turret, and then created a model that I then solved using three different CFD models. I then compared the solutions to one another and looked at how much longer it took to find the more accurate answers. I found that complex solutions took a very long time. So much so that I was not able to come to a finite answer to the original question because my research was not as important as some of the other projects that they had to solve, and I was bumped off the computers. I was able to find and verify a very interesting phenomenon known as vortex shedding that occurs when a fluid flows by a blunt object.
Synthesis and study of a novel family of conjugated carbazole centered compounds with potential applications in organic light-emitting diodes (OLEDs)

Faculty Sponsor: Caroline Pharr

Myunghoon Kim

Synthesis and study of a novel family of conjugated carbazole centered compounds with potential applications in organic light-emitting diodes (OLEDs) have been of great interest in various technological applications. Currently, there have been many successful syntheses of stable organic compounds capable of emitting red and green light. However, synthesis of stable blue light-emitting compounds has proven to be challenging. Synthesis of a novel family of carbazole centered molecules is underway with hopes of creating a stable blue light emitter. The parent compound is comprised of three subunit molecules, which to date have been synthesized: 4-bromodiphenylacetylene, 2,7-dibromocarbazole, and 1-(2',3',4',5'-tetraphenyl)phenyl-4-bromobenzene (Dendron). Currently, a one-pot Suzuki-Miyaura cross-coupling reaction containing magnesium diheteroarylboronate intermediates is being carried out to link the subunit molecules together and yield the parent compound of interest. Upon synthesis of the parent molecule, its properties will be studied via UV-vis, fluorescence spectroscopy, and cyclic voltammetry. Light emission will be studied and tested in solution and in thin film form, before and after exposure to air and heat.
It is easy for a person to assume that language is a value-neutral aspect of human culture since it serves most basically as a means of communication between human beings. Indeed, the principles of language are ingrained so deeply into the foundations of society that such an assumption seems only logical. But to view language in such a neutral way is to overlook the ideologies from which it is manufactured. My paper seeks to reveal those ideologies. I show that instead of a value-neutral tool for communication, language is in fact a tool for oppression. Drawing on experts such as Norman Fairclough and James W. Tollefson, I show that language and language learning are controlled by an elite ruling class in society and used as a defining element of social and economic class. The minority elite in society promote the standard dialect, the language of power, and use it as a requirement for high status jobs and political positions. The elite deliberately keep the majority from a thorough knowledge of this language, which preserves socioeconomic inequality. Using this Marxist approach to language, I develop my own dialect in an original short story, “Counterpoint.” The story is set in the future where the upper and lower classes speak different dialects, and it is the poor who are stuck in perpetual cycle of subjugation reinforced by the language differences.
Jonathan Lenz

The effect of chytridiomycosis and bioaugmentation on the metabolic rate of the red-backed salamander, *Plethodon cinereus*

*Faculty Sponsor: Brandon Sheafor  Presentation*

The infectious disease chytridiomycosis caused by the fungal pathogen *Batrachochytrium dendrobatidis, Bd*, contributes to worldwide amphibian decline, but definitive pathogenesis of lethality for the disease is not well understood. Because amphibians respire through their skin (in addition to respiration using lungs), it is speculated that amphibians with chytridiomycosis may show a decrease in metabolic rate, but amphibians bioaugmented with probiotic bacteria may alleviate possible metabolic stress. A species of lungless salamander (*Plethodon cinereus*) was used in this study to analyze the cutaneous effects of *Bd* on metabolic rate in vivo. Net weight change, infection load (using a Taqman real time PCR assay), and metabolic data (using a Sable Systems Field Metabolic System) of salamanders were recorded over the course of a 25 day span. Data demonstrate that salamanders infected with *Bd* may possess a higher overall metabolic rate, but further research must be conducted to confirm statistical significance. Real time Taqman PCR results suggest that salamanders infected with *Bd* were able to clear infections in less than a few weeks due to rise and subsequent decline in detection of zoospore genomic equivalence despite showing weight loss and other characteristic symptoms of chytridiomycosis. Further research including more intense infection of salamanders, application of techniques to minimize PCR inhibitors, and recording of metabolic data in a refined experimental environment are needed to better understand these phenomena.
Colleen McCarthy

Judging Rhetorical Credibility—A Website Analysis of Montana’s 2012 Gubernatorial Candidates

Faculty Sponsor: Alan Hansen

Presentation

In the book Rhetoric Online (2007), Barbara Warnick theorizes that users of websites make judgments about the ethos, or credibility, of content they access on websites. Historically, judging the speaker’s ethos or credibility was often based on cultural factors and content of a message (Craig & Mueller, 2007). In this light, how is the effectiveness and strength of online Rhetoric measured? Warnick (2007) proposes elements of the communication process through which online credibility can be measured, including: reception, source, time and space. In this paper, I examined the three 2012 Montana gubernatorial candidates’ websites, utilizing four elements. I also explored the criteria that website users themselves assessed the credibility of online information by asking students at a liberal arts college in Western Montana to review the three gubernatorial candidates’ websites. The students perused the sites in groups and their discussion was analyzed using Thematic Analysis. Findings emerged from the analysis, including the following: Participants emphasized the “reception” element, which involves structure, aesthetic appeal and use of the latest technology in the website; and students identified a lack of credibility with undocumented claims on one of the websites in particular.
Beneath the Nature of Sacrifice:
“Ce qui est terrible, ce n’est pas de souffrir ni de mourir, mais de mourir en vain” (“What is terrible is not to suffer or to die, but to die in vain,” Jean Paul Sartre)

Faculty Sponsor: Elvira Roncalli

Presentation

Being the only organisms that kill as an offering to a higher purpose, we engage in actions of propitiation and worship. What is it that the human understands is being offered towards this higher purpose, and what is this our understanding of this higher purpose? From ritual human sacrifices like those of the Aztecs to suicide bombers in crowded plazas, the questions between what constitutes sacrifice and what constitutes murder reveal the ambiguity of our social interactions within our understanding of an individual’s offering towards a higher purpose. What is ‘given up’ by the individual during the offering up of the sacrifice? By engaging in sacrificial rituals, humans have disclosed the potentiality of engaging in purposeful visionary or mystical experiences with that towards which they offer up the sacrifice. This existential analysis reveals the thrown projection of humans as a means for disclosing our understanding of the act of sacrifice in regards to our devotion to and desire to appease a higher purpose.
The industry of outsourced surrogacy is on the rise. This trend is most pronounced in India, where tens of thousands of childless couples find solace in a business that allows them to “rent out” the womb of an Indian woman to act as a surrogate. However, as with any industry, surrogacy is not a simple business. On one hand, the wages paid to the women hired is substantially more than most of them have or will ever receive, and provides an opportunity for economic competitiveness with their male counterparts. On the other hand, relative to the amount that couples pay there is substantial financial inequity between the surrogates themselves and the companies that hire them. The industry also gives rise to a number of citizenship issues, including the following: Can children who are conceived and born in one country cross national borders legally? Is there a legal process in place to account for surrogacy? Finally, the way in which media portrays the industry has a direct impact on the popularity as well as the international public perception of outsourced surrogacy. In this paper we examine the media, gender and globalization aspects of the growing industry of surrogacy.

The purpose of this thesis was to examine whether individuals receiving hyperbaric oxygen therapy (HBOT) experienced any statistical differences
in uncertainty before and after their first session and to explore their feelings regarding HBOT. Participants in this study included 10 prospective HBOT clients, without prior HBOT experience, between the ages of 25 and 53. There were six males, one female, and three who did not identify their gender. Participation was solicited through the use of researcher flyers which were distributed to eligible clients by nursing staff at a hyperbaric facility in the Northwestern United States. A mixed-methods design was used to analyze the participants’ feelings regarding HBOT and uncertainty. Data was collected using a pre-treatment and post-treatment survey spanning one session of HBOT. The results of this study indicated a statistical difference in uncertainty before and after the first session of HBOT with a p-value of 0.012, however, this was only a minor change and the effect size was small. Overall, participants’ generally reported positive interactions with staff. Only two subjects expressed discomfort during their session and one did not report on experience inside the chamber. The findings of this study indicate a need for knowledgeable and caring nurses who fully educate their clients before treatment begins and who provide comfort and assistance throughout treatment. More research regarding client feelings toward HBOT and uncertainty is needed.

Marielle O’Hara-Hulett

**Determination of Binding Affinity of a Florescently Labeled H1\(^0\) to Nucleosomal Substrates**

*Faculty Sponsor: Kyle Strode*  
*Presentation*

Linker histone H1 is an abundant basic protein that binds to linker DNA. When it binds to the DNA that enters and exits the nucleosome, it facilitates chromatin compaction in order to form and maintain the 30nm chromatin fiber. In higher eukaryotes the protein has a tripartite structure consisting of a central globular domain flanked by relatively
unstructured N and C terminal domains (NTD and CTD). Through studies involving incremental deletions, the highly positively charged CTD has been proven to bind nucleosomal DNA with high affinity sub-domains in a charge based neutralization reaction. In order to study the role of the NTD similar studies, with respect to the CTD, will need to be performed. The binding affinity (KD) will be determined by a fluorescently labeled derivative to various nucleosomal substrates. NTD deletion mutants as well as proteins devoid of both the NTD and the CTD will be used to determine binding affinity. To begin this process, globular domain labeling mutants with binding properties identical to the wild type must first be created. In this study, S50C H1 among other mutants were bacterially expressed and purified over two affinity columns. The purified protein derivatives were then labeled with a molecular probe, iodoacetimide Oregon Green 288. Free Oregon Green dye was then removed through chromatography via size exclusion column. The protein activities for the wild type, S50C H1 unlabeled, and S50C H1 Oregon Green labeled were then analyzed using an electrophoretic mobility shift assay. The results indicate that S50C H1 has a lower binding affinity than the wild type and even less when labeled with Oregon Green. Due to the observed binding it is concluded that S50C H1 is unsuited to be used in binding affinity studies because it has a decreased binding affinity when compared to the wild type.

Emily Orenstein

Organic Solar Cells: A Sustainable Solution

Faculty Sponsor: Kyle Strode

Organic solar cells use cheaper materials and less of these materials than silicon-based solar cells. Yet organic solar cells are much less efficient. Research is being done to examine what will increase the efficiency of organic solar devices.
Through variation of deposition of the active layer, with the use of spin and spray techniques, the morphology of organic photovoltaic devices, due to its impact on the power conversion efficiency and charge mobilities, was determined to be a factor in the properties of organic photovoltaics.

Daniel Pearson

Shann Ray: The Art of Masculinity

Faculty Sponsor: Kay Satre Presentation

In his 2011 collection of short stories, American Masculine, Shann Ray aims to capture the complexities of life in 21st century American-West through a litany of alcoholism, suicide, divorce, and child battery. My paper sets out to demonstrate the idea of masculinity in the American-West, exploring the ideals of this persona that literature has represented over the past century. Comparing Ray's short stories with Owen Wister's The Virginian, the first western novel, I analyze what these literary texts have to say about the culture of masculinity during its particular era. For the 21st century, Ferch looks not to erase the previous portrait of manhood, but to reclaim the courageous, soft-spoken, moral identities of American masculinity that were initially represented in the heroes of the West while subtly incorporating boldness, humility, leadership, and forgiveness, ultimately binding the iconic loner masculinity to a masculinity within community.

Jeremy Peters

Domestic Violence: Why People Stay

Faculty Sponsor: Libbie Chute Presentation

Domestic violence is a complex social phenomenon that spans every age, ethnicity, race, and social group (Teaster 2006). Research has revealed that both men and women commit these violent acts (Johnson 2005). Continued research into domestic violence is critical in order to identify
effective ways to treat victims of past domestic violence as well as preventative measures to eliminate future acts of domestic violence. Until more research is conducted, domestic violence will continue its negative affect on society. Research is difficult to conduct since domestic violence is a form of deviance that isn’t consistently reported to the authorities. When violence goes un-checked, there is no way for people to learn and help themselves. Our society has created services to help people escape violence. Researchers have also studied demographics to see which groups are more likely to be violent. This research is aimed to gain a deeper understanding of why individuals stay in violent relationships. This research is a qualitative analytical examination of men and women's influence over exchange communication in relation to domestic violence. Information gathered from governmental sources will provide the basis of secondary data that will be used to interpret the importance for power in social exchange.

Sarah Reehl
Zombie Fever: Forecasting an Undead Epidemic

Faculty Sponsor: Holly Zullo Presentation

The SIR model uses population compartments to describe the spread of infectious disease throughout an entire population. In this paper we apply the SIR model to the 2012 seasonal strain of influenza as well as pop culture trends. We first explore the dynamics of SIR parameters to gain a deeper understanding of SIR models within the well-studied area of seasonal influenza. Then we apply similar techniques to measure pop culture trends with the Google NGram Viewer. The trend we focus our models on is the recent surface of the popular horror staple-zombies. We carefully determine three different models that forecast the future of zombie pop culture according to literary frequency. The most likely model predicts a peak in the zombie craze near the year 2038.
Approximately 1 in 5 returning service members from Iraq and Afghanistan report symptoms of Post-Traumatic Stress Disorder (PTSD) (Tanielian & Jaycox, 2008), and 22 percent of veterans suffering from PTSD also report symptoms of Social Anxiety Disorder (SAD). Mental health disorders such as PTSD have been shown to reduce the overall self-perceived quality of life in Vietnam veterans (Hansson, 2002). The effectiveness of using animals in therapeutic settings for mental health disorders has proven to be successful, specifically demonstrated to be therapeutic and beneficial in treating disorders such as anxiety and PTSD (Chandler, 2005). It is unclear whether veterans who own a pet would report fewer symptoms of PTSD and SAD and perceive a higher quality of life than veterans who do not own a pet. This study examined the relationship between companion dog ownership on veteran mental health and perceived quality of life. Seventy nine veterans (58 male, 21 female) were recruited from Facebook’s veterans groups who completed an online survey gathering information on dog ownership, symptoms of PTSD and SAD, perceived quality of life, and several demographics. No significant relationships were observed between these variables after conducting Pearson’s r correlational analyses. However, a significant correlation was found between veterans who have an “indifferent” view of pet dogs and levels of SAD. Implications of the findings are discussed in how to design future studies that research the relationship between the human-animal bond and mental health disorders in returning service members.
Steven Reistroffer

**A Geospatial Approach to Modeling Pine Beetle Infestation in Helena National Forest**

*Faculty Sponsor: Willis Weight*  
*Poster*

With beetle infested pines becoming more of an issue in the Helena National Forest, it is important to practice methods to quantify the extent of the infestation in order to understand future potential spread and opportunities for resource management. This study uses a two-sided, geospatial approach to identify the extent of the infestation and to model the potential spread of the infestation. First, high-resolution aerial imagery is used in concert with a raster processing algorithm to identify existing infected tree stands. Second, multispectral satellite imagery data, in concert with various habitat and topography data, are used to model at-risk areas where potential spread and amount of spread can be calculated through use of mixing models. These methods are used over a relatively small sample area, with the purpose being to provide an indication for Helena National Forest as a whole.

Sabrina Rhines

**Scheduling Conflicts: An Exploration in Scheduling Irrigation Systems of a Closed Campus**

*Faculty Sponsor: Tim Melvin*  
*Poster*

Carroll College has an issue between its irrigation system and pedestrian walkways. Because of the structure of the sprinkler system and types of sprinkler heads that are used, the spray of the sprinklers often disrupt the walking paths between buildings. This problem is most noted at times of high pedestrian traffic when students walk between the classroom buildings. We hope to minimize this problem
by analyzing the irrigation system then scheduling the sprinklers to only go off during times of low to zero pedestrian traffic while continuing to water adequately—maintaining the green lush grass seen around Carroll’s campus.

Emily Ross

Testing Learning Performance in Eyeblink Conditioning

Faculty Sponsor: Kyle Strode Presentation

Pavlovian eyeblink conditioning is a behavioral paradigm vastly employed in the study of associative learning and implicit memory. In eyeblink conditioning, an initially neutral stimulus, like a tone or light (Conditioned Stimulus, CS), is repeatedly paired with an aversive stimulus, like an air puff to the cornea (Unconditioned Stimulus, US) with a fixed time lag (called inter stimulus interval). After several pairings, the animal learns to associate the CS and the US by producing an anticipatory and protective closure of the eyelid in presence of the CS, called conditioned response (CR). In the past decades, the head-fixed rabbit has been used as the standard preparation for such paradigm. On the other hand, a growing body of genetic tools made available for mice (like transgenics and optogenetics) has pushed many researchers to adopt the mouse preparation for eyeblink conditioning (Chettih et al., 2011). It has been shown that with the use of light as a CS, a long inter stimulus interval (ISI), considered to be more than 400 ms, leads to a poor learning performance in the mouse preparation whereas in the rabbit such interval can be pushed to more than one second (Chettih et al., 2011) (Millenson et al., 1977). In this work we demonstrate that by employing an air puff to the mouse’s whiskers as the CS near optimal performance can be reached even with a long inter stimulus interval.
Brandon Saiki

**Migraine Headaches: Are they an issue at Carroll College?**

*Faculty Sponsor: Willis Weight*  
*Presentation*

Across the United States, migraine headaches continue to have a significant impact on the lives of many college and university students. In some cases, the symptoms and onset are so debilitating that it leads to poor academic performance and reduced quality of life. To evaluate this issue at Carroll, a cross-sectional survey was administered to research the prevalence, trigger factors, and consequences associated with migraine headaches. It was conducted in the fall of 2012 among college students in over 20 courses at Carroll College in Helena, MT, USA. Among the 1,508 enrolled students for the fall semester of the academic calendar year 2012-2013, 546 surveys were returned. A good distribution of freshman, sophomores, juniors, and seniors were obtained to evaluate comparisons of sub-populations. This instrumental tool suggested that migraine headaches are not only debilitating for some students, but went as far as impacting quality of life and interfering with basic activities of daily living (ADLs). A summary of findings among the Carroll student community and subpopulations will be given at the presentation. Further research is needed to affirm these data and suggest there may be deeper relationships between the onset of migraine headaches and particular patterns or habits of daily living. Data from similar undergraduate, private institutions in the state of Montana would also improve the data pool and allow for comparison and contrasts between other colleges and undergraduate students.
Colorectal cancer is the third most common type of cancer in the U.S., with about 138,000 diagnoses annually. Early diagnosis through screening dramatically increases patient survival rates. Insured individuals may have better access to cancer screening, and as a result, better health outcomes. The purpose of this study was to determine if insurance status affects the probability of a late stage colorectal cancer diagnosis. We analyzed 3006 cases of colorectal cancer from 2002 to 2011 gathered from the Montana Central Tumor Registry (MCTR) and used Chi-square tests to compare stage of cancer diagnosis to insurance status, ethnicity, age, and year. Results suggested that patient insurance status is an important indicator of the stage at which patients are diagnosed with colorectal cancer ($F=17.0515$, $p$-value$=0.0002$, critical value$=9.210$, alpha$=0.01$). These results support public health policy that extends health insurance coverage to a greater proportion of the population in order to decrease the probability of late stage colorectal cancer diagnoses and better community health outcomes.
Phoenicia Skye Summers

**Prostitution: An Analytical Approach**

*Faculty Sponsor: Jamie Dolan  Presentation*

Due to the effects of childhood sexual abuse, prostitution seems to be more common among those that were abused. Prostitution is a dangerous career that perpetuates the victimization that occurred at a younger age, and leaves the individual to believe that this is all that they are meant for. Through symbolic interactionism, especially affect control theory and Erving Goffmans theory on dramaturgy, one can begin to see from a sociological standpoint why this might happen. Past literature has been compiled and analyzed in conjunction with these two theories to find an explanation as to why this pattern occurs. Child sexual abuse has a high rate of occurrence among prostitutes and other criminal behavior which would lead one to see a kind of cause and effect. Although, there seems to be a pattern, this does not account for all those that are sexually abused, nor does it account for all prostitutes. Therefore, this research also suggests further study into what leads to prostitution and the effects of abuse.

Graham Unis

**Infection Rate of West Nile virus in *Culex tarsalis* at Medicine Lake Wildlife Refuge and Ninepipe Wildlife Refuge in 2012**

*Faculty Sponsor: Sam Alvey  Poster*

This study focused on the infection rate of West Nile virus of *Culex tarsalis* populations at Medicine Lake Wildlife Refuge (MLWR) and Ninepipe Wildlife Refuge (NWR). My research was done in order to determine if there was statistical difference in the infection rate between NWR and MLWR via a bias corrected ML estimate. These locations
were chosen because they were ideal locations for West Nile virus (WNV) and in the case of MLWR, past positive *C. tarsalis* pools. My study involved trapping mosquitoes, sorting out the *C. tarsalis*, and isolating WNV from mosquito homogenate. Once *C. tarsalis* had been sorted, they were homogenized and total RNA was extracted. This RNA was analyzed for WNV by using a TAQman assay RT PCR. My research indicated that there was no statistical difference in the relative infection rate between MLWR and NWR. Positive samples were found at Bowdoin, Fort Belknap, MLWR, and NWR as part of an active monitoring program for West Nile virus in Montana.

Katherine Williams

**Monastic Women in Defiance to the Catholic Church: The Lives of Hildegard of Bingen and Sister Mary Theresa Kane**

*Faculty Sponsor: Jeanette Fregulia  Presentation*

The environment in which women function within the Catholic Church has always been different from that of men, and remains that way even today. Within monastic orders, women have the potential to influence the Church, but often do not take the opportunity to do so. In the 12th century, a woman emerged who would have a profound impact on the Church—Hildegard of Bingen. Through her advanced work that spanned beyond the norm of monastic women of her time, she eventually influenced and made changes to practices within her religion. Centuries later, another monastic woman who desired change within the Church began her work making changes as well. In the 1970s, Sister Mary Theresa Kane began a campaign to include women more heavily within the Church hierarchy, even going so far as to request that the Pope allow women to practice as priests. Both Saint Hildegard and Sister Kane defied and even defined what the
place of women in the Church could be. In the case of Saint Hildegard, the Church has recognized her great contributions as doctrine, something not many women can claim even today. In the case of Sister Mary Theresa Kane, her goals have not yet been fully reached, and they may not be reached within her lifetime. However, it took over 800 years after the death of Hildegard for her to be recognized as a Doctor of the Church, and much has changed since then. Perhaps 800 years from now, Kane’s hopes for the Church will have been achieved, and if they are, many more strong and prominent monastic women should emerge. These women did not act in the ways that they did in order to demean their faith. In fact, their purpose was the opposite. Their faith, especially in the case of Hildegard, but no doubt also in Kane’s case, was one of the driving forces behind their seeking reformation within the Church. In this way, both women do fit the mold of the monastic woman—pious, faithful, and devoted. But in contrast to the average nun, their actions to promote their ideas of prosperity of the Church are what separate these two women, as well as other defiant monastic women throughout the ages, from other women inside the Church.

Nate Woods

Web Analytics with N8stats

Faculty Sponsor: Mark Parker Poster

The Web provides businesses the opportunity to present and market themselves as never before. Given the ability to present almost unlimited information, a key question is how should that information be organized. N8stats is a web analytics system that I’ve designed to provide feedback on website structure and design in real-time. In particular, I explore the use of regression analysis to determine the correlation between time spent browsing a web page and page word count as a measure of whether user’s are reading content on a page. Markov chain analysis is also used to determine whether or
not users are clicking through a particular page to reach content on a second or third page. This project walks through the development of the N_stats tool and an analysis of the Carroll College web site using data collected during Fall 2012.

Amanda Wreggelsworth

**Spatial Risk Mapping of West Nile Virus Based on Vegetation in Montana**

*Faculty Sponsor: Grant Hokit  Presentation*

In the present study, spatial epidemiology was applied to the vegetation in Montana by combining Normalized Differentiated Vegetation Index (NDVI) data, landcover data, and a thermal layer to create a predictive model of *C. tarsalis* in Montana. Samples of *C. tarsalis*, which has been identified as the primary vector for West Nile Virus in Montana, were collected from June to August 2013 at various sites across the state. ArcGIS and MaxENT software was used to create a model for June, July, and August. Overall, there was a modal correlation between vegetation density and the presence of *C. tarsalis* and a positive correlation between both the thermal and vegetation layers and the presence of *C. tarsalis*. The models and their corresponding data outputs provide insight into mosquito presence throughout Montana, which in turn may help isolate WNV hot spots.
Will Wright
The Enduring Frontier: Joseph and Ercell Flood and Homesteading in Postwar Idaho, 1941–1956

Faculty Sponsor: Jeanette Fregulia  Presentation

This essay argues that the frontier, if defined as the availability of free land, was in fact not closed in 1890 as proclaimed by the famous Turner thesis. Furthermore, this paper reinforces historian Brian Q. Cannon’s work, which argues that the federal homestead program did not end in the 1930s—as many prominent western historians assert—but rather, in 1976 in the lower 48 states and 1986 in Alaska. To strengthen these claims, this essay uses the agricultural experiences of Joe and Ercell Flood as a case study of those who took advantage of the post-World War II homestead law which allowed veterans to farm on newly-expanded reclamation projects throughout the West. Using materials obtained from family sources which include oral histories, government documents, videos, and memoirs, as well as information from newspaper archives, federal statutes, and magazine archives, this essay looks at the Flood family’s undertakings from 1941—the United States’ entrance into World War II—to 1956—the attainment of a land patent to their farm on the Minidoka Project in Idaho. This paper provides an original contribution to the field of history for three reasons: (1) the postwar homesteading topic is limited to Cannon’s book as the only published work; (2) this essay is unique from Cannon’s monograph in that he did not interview or use sources from Joe and Ercell Flood; and (3) this thesis includes a children’s perspective on the postwar homestead experience, which Cannon’s work does not. Thus, the homesteading experiences of Joe and Ercell Flood provide an account of the enduring frontier, by which the prospects of new settlement did not vanish as lands became available to farm.
Jean-Paul Sartre’s *NO EXIT*

Faculty Sponsor: Elvira Roncalli

This one act play, by Jean-Paul Sartre, confronts us with some of the most important themes of Existentialism. While the characters are few, the play provides the setting for an in depth examination of them: what they say of themselves, how they present themselves to the others, how they interact with each other. They are in a drawing room with no windows; there is a door, but it is locked. In other words, there is *no exit* from this place. What can it possibly mean? How did these characters get there in the first place? What did Sartre want to convey through this play? In what ways does it still speak to us today?

A public reading of *No Exit* followed by discussion, was performed by the Continental Philosophy Course in the Fall 2012. Mary, Joey, Mark, Brandon, Michael and Haleigh, some of the students who performed the play in the Fall, will share their perspectives on the play and what it means to them, philosophically speaking, that is.