25th Annual Westmont College

Student Research Symposium

WESTMONT

April 22, 2021
3:30-5:00 p.m.

Top Tennis Courts
Westmont College

2021 Spring Research Symposium

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One of the hallmarks of Westmont College's academic program consists in the opportunity for undergraduate students to work directly with faculty on research and scholarly projects. Work presented at the Student Research Symposium includes student work conducted during the past year, from the divisions of the Humanities, Social Sciences, and the Natural and Behavioral Sciences. The purpose of this symposium is to celebrate the noteworthy accomplishments of Westmont students.

With special appreciation for support from the Office of the Provost

PARTICIPANTS

Morgan Alloway '22
Chemistry
Poster #32

Tyler Austin '21
Kinesiology
Poster #2

Chloe Blish '21
English
Poster #20

Karis Cho '21
English, Religious Studies
Poster #19

Kendra Dayton '21
Biology
Poster #3

Bryan P. Dionisio '22
Chemistry
Poster #18

Renn Duncan '21
Chemistry
Poster #35

Alexandra Ebert '21
Chemistry
Poster #12

Brendan Fong '21
Sociology
Poster #23

Sarah Garland '21
Sociology
Poster #22

Brook Gauthier '21
Global Studies
Poster #36

Winston Gee '21
Chemistry
Poster #16

Brianna Gilman '21
Psychology
Poster #28

Charis Isabel Guerzo '21
Sociology
Poster #6

Hayden Guthrie '21
Kinesiology
Poster #2

Christopher Hanessian '21
Psychology
Poster #9

Anastasia Heaton '21
History
Poster #37

Jessica Herdrich '21
English
Poster #1

Maggie Hime '21
Chemistry
Posters #26, #27

Emma Hoerauf '21
Sociology
Poster #13

Isabelle Hugoniot '23
Biology
Poster #34

Taylor Jennings '21
Psychology
Poster #10

Nick Jensen '21
English
Poster #17

Jason Joseph '21
Chemistry
Poster #35

Trent Keeler '21
Chemistry
Poster #24

Tiana Krukar '22
Chemistry
Poster #16

Chloe Liebengood '21
Psychology
Poster #5

Asher T. Littlejohn '24
Chemistry
Poster #18

Joe Lorentsen '21
Kinesiology, Mathematics
Poster #31

Rachel Lorson '22
Chemistry
Poster #16

Kyle Mayl '21
Communication Studies
Poster #25

Kristen Mohrhoff '21
Psychology
Poster #11

Zackery E. Moreau '21
Chemistry
Poster #18

Marliss Neal '22
Chemistry
Posters #26, #27

Katie L. Nili '22
Chemistry
Poster #18

Faith Palombi '21
Physics
Poster #4

Leila Parker '21
Chemistry
Poster #32

Laura Joy Phillips '21
English
Poster #33

R. Christian Reynolds '21
Psychology
Poster #15

Samantha C. Rosenhagen '23
Chemistry
Poster #18

Alexander Rurik '23
Biology
Poster #34

Rachel Schulz '21
Chemistry
Posters #26, #27

Maisy Simmonds '21
Chemistry
Poster #30

Alice Solorzano '21
Psychology
Poster #29

Daniel Staples '21
Physics
Poster #21

Valerie Swisher '21
Psychology
Posters #7, #8

Grant Thomas '21
Biology
Poster #14

Cassidy C. Tran '23
Chemistry
Poster #18

Seth Wilmoth '21
Biology
Poster #3

Nadya Wisham '21
Kinesiology
Poster #2

ABSTRACTS

1. The Case For Ethnic Studies Classes In High Schools

Jessica Herdrich '21
English
Dr. Kya Mangrum

Requiring ethnic studies classes in high schools is one tangible way for the U.S to begin the process of reparation and reconciliation. Currently, these programs are few and far between, with too low a number of qualified teachers to teach them and often no readily available training for those interested. Parents and community members are not familiar with what is even taught in these classes. Especially as Santa Barbara begins the process of implementing an ethnic studies class requirement in the Santa Barbara Unified School District, we need community understanding and support. Even more, we need qualified teachers to pursue teaching ethnic studies in high schools. My presentation aims to educate and inspire support for these classes as well as inspiring Westmont students to pursue a career in high school ethnic studies through in- depth research on the benefits and interviews with community members involved in ethnic studies.

2. Assessing Passenger Seat Belt and Sitting Tendencies For Advancement In Automotive Safety

Tyler Austin '22
Hayden Guthrie '21,
Nadya Wisham '21
Kinesiology
Dr. Adam Goodworth

Airbags and seat belts are safety features designed to protect individuals from harm in a car crash. These features are designed to operate optimally when passengers are in a standard sitting position at a distance away from the dash; and can potentially harm passengers out of this position. We investigated passenger sitting behavior in 469 participants through a short 2-3 minute survey. Our results showed a surprisingly high percentage of passengers who had an object by their lower extremities (51% reported this behavior "most of the time"). Also, passengers used their seat belt less in the back seat (23% decrease in backseat seat belt usage). Finally, passengers were about 2 inches closer to the dash when someone was in the back seat. This research is a step forward to help manufacturers better equip vehicles (e.g., new sensors) to protect and educate passengers who typically adopt more unsafe positions.

3. The Effects of Urbanization on Acorn Woodpecker Daily Activity Patterns and Reproduction

Kendra Dayton '21
Seth Wilmoth '21
Biology
Dr. Amanda Sparkman

Human development has drastically changed the natural environment, presenting new ecological challenges such as artificial light and noise pollution. While some species struggle to adapt to these novel circumstances, others seem to thrive in an urban environment, and often exhibit behavioral, physiological, and/or morphological changes. We tested for effects of urbanization on daily activity patterns, group composition, and reproduction in the cooperatively-breeding, cavity- nesting acorn woodpecker (Melanerpes Formicivorus) in Santa Barbara, CA. We compared family groups living in high and low levels of urbanization, defined by indices of light and noise. We found that urban woodpecker families began activity later in the morning and vocalized less in the evenings than non-urban families. Furthermore, urban woodpecker groups were smaller with fewer males. There was no difference in group or individual reproductive success between urban and non-urban groups. We propose that cavity nesting could mitigate potentially harmful effects of light and noise pollution.

4. Linear Polarization Measurements and Parity Determinations In ^{70}ga

Faith Palombi '21
Physics
Dr. Robert Haring-Kaye

The purpose of this research was to look for evidence of deformation in the structure of the odd- odd ^{70}Ga nucleus at high angular momentum (spin). Although the low-spin states can mostly be understood in terms of spherical shapes, a previous study has indicated a 9+ state at 2887 keV, which could indicate the occupation of the $g_{9/2}$ orbital by the unpaired proton and neutron. Characteristics of $g_{9/2}$ orbital occupation are high angular momentum, positive parity and deformation. Thus positive-parity states observed at high spin in 70Ga might be a signature of deformed shapes. During the course of this research, we sought to experimentally confirm the positive parity of the 2887-keV state, and determine the parity of other nearby states, in order to seek evidence of deformation within the nucleus. The data used in this research were obtained from the ^{62}Ni(^{14}c, αpn) reaction at 50 MeV performed at Florida State University, which produced ^{70}ga nuclei at high spin. Throughout the reaction, γ rays were detected using background suppression and coincidence filtering from seven single-crystal Ge detectors as well as three Clover detectors. The Clover detectors were used to measure the linear polarization of several gamma-ray transitions, from which parity assignments were inferred. The results of these measurements, along with their implications for the interpretation of the underlying structure of ^{70}Ga, will be presented.

5. A Comparison of The Effects of Classical Music and Lo-Fi Beats on Relaxation

Chloe Liebengood '21
Assistant: Victoria Silva '23
Psychology
Dr. Brenda Smith
Dr. Ronald See

Stress and anxiety are associated with a number of negative health outcomes. Thus, it is important to identify and implement effective coping mechanisms that aim to reduce stress and mitigate its negative effects. One such proposed mechanism is listening to music. In previous research, classical music has been shown to reduce stress; however, anecdotal evidence suggests that lo-fi beats may produce similar results. This study compared the relaxing effects of classical music and lo-fi beats music in participants exposed to a cognitive stressor. We hypothesized that participants who listened to lo-fi beats would demonstrate greater relaxation than those who listened to classical music, as measured by both heart rate (beats per minute) and a psychological assessment of stress, the State-Trait Anxiety Inventory (STAI). Based on the psychological measure, preliminary findings suggest that listening to music induced relaxation in participants, although neither genre of music appeared to be more effective. Further results will be presented that address the effects of music on heart rate and potential interactions of the physiological and psychological measures.

6. **The Embodied Experience of BIPOC Students in White Academic Spaces When Awareness to Racial Injustice Increases**

Charis Isabel Guerzo '21
Sociology
Dr. Meredith Whitnah

This paper examines the impact of increased institutional and societal awareness to racial injustice on black, indigenous, and people of color (BIPOC) in white academic spaces. Through in-depth interviews with 11 BIPOC students at a predominantly white institution (PWI), this study seeks to understand how students embodied and academic learning experiences are affected by three factors: (1) how the institution responds to racial injustice, (2) how equipped professors are in facilitating discussions on race with their students, and (3) the nature of white academic spaces. The students' multiple and distinct narratives revealed that their experience was enhanced when they were actively supported by friends, allies, professors, and/or the institution. By illustrating the intended and unintended consequences of this PWI'S increased, but amateur awareness of institutional racism and whiteness, this study contributes to how higher education continues to privilege white knowledge validation processes and applications of knowledge.

7. **How Anxiety and Depression Affect Cognition Among Those with Parkinson's Disease**

Valerie Swisher '21
Psychology
Dr. Steve Rogers

Depression and anxiety are among the most common comorbidities in individuals with Parkinson's disease (PD). While the presence of anxiety and depression affects cognitive performance, many clinicians do not make distinctions in the cognitive profiles between Parkinson's patients who have depression relative to those with anxiety. In the present study, 129 patients diagnosed with PD (M age = 73.67, M education = 15.50) completed comprehensive neuropsychological assessment as part of outpatient neurological evaluations. Although anxiety and depression were both negatively correlated with select aspects of processing speed, frontal- executive functioning, and visuospatial abilities, anxiety had a differentially greater and worse impact, suggesting a need for customized conceptualization and treatment.

8. **The Effect of Behavioral Disinhibition on The Cognitive Profile of Individuals with Frontotemporal Dementia**

Valerie Swisher '21
Psychology
Dr. Steve Rogers

This study examines how differences in cognition vary with behavioral disinhibition among those with Frontotemporal Dementia (FTD). A total of 20 adults (11 men, M age = 76.00) with FTD 40% of whom demonstrated behavior inhibition, participated in neuropsychological testing as part of outpatient neurology evaluations. Statistical analyses revealed that those with behavioral disinhibition performed significantly better on domains of working memory, graphomotor speed, and verbal fluency. These findings suggest that patients with FTD who experience behavioral disinhibition exhibit stronger cognition in domains typically impacted by FTD relative to their counterparts who lack this disinhibition. Interestingly, although behavioral disinhibition can be deleterious to many aspects of the lives of patients and families of those with FTD, this negative impact does not appear to extend to the realm of cognition.

9. Replication Study Examining How Identity Integration of Religious And LGBTQ+ Identities Influence Levels of Guilt and Shame

Christopher Hanessian '21
Psychology
Dr. Brenda Smith
Dr. Ronald See

Belonging to different identities that are perceived as incompatible or conflicting has been shown to lead to negative outcomes such as depression, guilt, shame, and feelings of alienation. Different strategies have been used by individuals who feel conflict between their identities, including identity integration which is a blending of the two. A previous study in adults examined how the ability of someone to integrate their identities can impact levels of guilt and shame. The current replication study assessed individuals that identify as being LGBTQ+ and religious, with a specific focus on a population of college students between the ages of 18-25, a period of key developmental stages. A sample of self-identified LGBTQ+ religious college students mostly from the Santa Barbara area took an online questionnaire with different measures of gay and religious identification, guilt and shame, and identity integration. The results and implications will be discussed.

10. The Effects of Sensory Integration and Lower Extremity Agility and Coordination on Walking Balance

Taylor Jennings '21
Kinesiology
Dr. Adam Goodworth

Human balance control is a critical prerequisite to nearly all activities, and human falls are a major health concern. The most robust way to assess reactive balance during standing is to apply external perturbations. Perturbations challenge balance and provide mechanistic insights into people's ability to maintain stability. Researchers are now extending the use of perturbations to examine walking balance. However, current devices that perturb walking in research settings are not likely to see wide clinical use due to cost, space, and time constraints. The present study examines the relationship between frontal plane on a research-based perturbation walking device and in standard clinical standing balance assessments. We found correlations varied widely depending on the conditions compared. Correlations between standing and walking balance were highest when 1) a perturbation was present in walking tests, 2) subjects walked slowly, and 3) the standing tests were on foam as opposed to firm surface.

11. . The Effect of User Experience and User Interface on Comprehension, Frustration, And Cognitive Fatigue

Kristen Mohrhoff '21
Psychology
Dr. Brenda Smith
Dr. Ronald See

The efficiency of interface design depends on the specific psychological effects that it has upon the user. Maximal comprehension of interface-provided information occurs when an integrated stimulus allows for direct user interaction and focus upon the particular information necessary for full understanding; operative stimuli such as color, font readability, contrast levels, interactivity, and emotional effect can all either aid or interfere with levels of information processing. Research supports that interface design can be manipulated in ways that influence comprehension, emotional response, and attention through the utilization of user interface (UI) and user experience (UX) development techniques. The present study investigates the effects of UI and UX of a website on the comprehension of information provided, frustration, and cognitive fatigue; results involving a between-subject analysis of three varying conditions of UI and UX on these contingent psychological responses will be discussed.

12. Computational Study of The Reactivity Of *bis*CAN and *bis*BAN

Alexandra Ebert '21
Chemistry
Dr. Brandon Haines

*Bis*CAN and *bis*BAN have been developed as protected bisketene equivalents and can be used as dienophiles in Diels-Alder reactions with cyclopentadiene. Experimentally, *bis*BAN was found to be more reactive than *bis*CAN, so density functional theory (DFT) calculations were undertaken to understand this difference. A difference in the computed barriers between the Cl and Br substituted dienophiles of ~1 kcal/mol was found at the B2GP-PLYP-D3BJ/def2-TZVPPD//M06-2x/6-31g(d) level of theory. A series of isodesmic reactions were developed to investigate the effect of the halogen on the reaction in the presence of the electron-withdrawing CN substituents. In addition, we investigate experimental results showing that *bis*CAN and *bis*BAN can undergo sequential Diels-Alder reactions as a dienophile with another cyclopentadiene and that adding a Lewis acid, $B(C_6F_5)_3$, facilitates the reaction.

13. Impact of Social Norms on Student's Attitudes and Behaviors Towards Substance Abuse

Emma Hoerauf '21
Sociology
Dr. Meredith Whitnah

This research project examines the intersection of religion with deviance and social norms. The study specifically focuses on attitudes and behaviors towards substance use on a small Christian college campus with strict policies towards substances. This study takes into account how both formal and informal sanctions and norms impact substance use on a college campus. Through the qualitative analysis of fifteen in-depth interviews, this paper demonstrates that students were more influenced by informal sanctions and norms. This study provides insights that colleges could use to rethink their substance use policies with a more holistic approach to prevention of abuse. Additionally, it advances the sociological knowledge of deviance on a small, religious college campus in ways that have not been previously studied using qualitative research methods.

14. Determining the Effect of Tau R3 Fibrils on The Signaling Activity of Cultured Mouse Neurons

Grant Thomas '21
Biology
Dr. Yi-Fan Lu

Elevated levels of misfolded Tau proteins and neurofibrillary tangles (NFTS) are two biomarkers associated with Alzheimer's Disease (AD). Previous research has demonstrated that elevated concentrations of misfolded Tau are often present in AD patients prior to both detectable ad-associated cognitive decline and other biomarkers. Therefore, the goal of this project was to assess what effects the presence of Tau R3 fibrils have on the signaling activity of mouse neuron cultures through the use of a microelectrode array. By monitoring the electrical signals generated by mouse neurons, we were able to compare the bursting behavior of cultures grown in the presence of Tau fibrils to a control. We found that the fibril-exposed cultures displayed significant decreases in total bursting, number of spikes per burst, frequency of spiking within bursts, and burst duration compared to the control. This suggests that Tau NFTS may have a functional role in AD progression.

15. Effects of Disgust Priming on Gastric Rhythm and Moral Judgments

R. Christian Reynolds '21
Psychology
Dr. Ronald See

In the field of affective neuroscience, disgust is known to be a powerful emotive state with many higher cognitive effects. Of particular interest is its effect on moral judgements, where the priming of disgust can lead an individual to recommend a longer sentence for the same crime. In the present study, we tested the mechanisms underlying disgust and moral judgement by examining how disgust interacts with two different categories of unacceptable behavior. On one hand are actions of omission, defined as a lack of socially appropriate action which unfairly benefit the perpetrator. On the other, crimes of commission are defined as actions which take advantage of a crime committed in a manner that aggravates the overall harm done and benefits the perpetrator. Participants were assigned randomly to either a disgust or control condition in which they viewed either a disgusting or non-disgusting video. Participants then read and rated the moral wrongness of a described character in two vignettes, one from each condition. These were tested beforehand to ensure their equality. Gastric rhythm was collected throughout the process, allowing the comparison of disgust elicitation directly to moral severity.

16. Vinyl Cation Stabilization by β-Transition Metal Effect

Winston C. Gee '21
Rachel M. Lorson '22
Tiana W. Krukar '22
Chemistry
Dr. Brandon E. Haines

The β-TM effect is the ability of a transition metal to stabilize a carbocation two carbons away. We studied how a metal's ligand environment affects vinyl cation formation in a model reaction using density functional theory (DFT) calculations. For coordinatively saturated combinations of 12 ligands with different properties, we found a range of ionization free energy barriers ($\Delta G^{\ddagger}$) of 1.2 to 36.7 kcal mol^{-1} (53 structures). The computed $\Delta G^{\ddagger}$ values correlate well with parameters describing the electron-donating ability of the ligand, and a multiple linear regression model was built to further tease out the impact of various ligand factors on $\Delta G^{\ddagger}$. We also investigated cyclic vinyl cations, finding that a β-Pd lowers their formation barrier, but these computed barriers are still quite high (>28.1 kcal mol^{-1}). The elevated barrier for cyclic vinyl cations arises primarily (~70%) from geometric constraints imposed by the ring on the vinyl cation.

17. The Wastes: Woolf And Faulkner's Fictional Expansion of Jamesian Psychology

Nick Jensen '21
English
Dr. Cheri Larsen-Hoeckley

In *The Principles of Psychology* (1890), William James outlines his famous characteristics of consciousness, including features such as unbreakability, isolation, and a boundedness towards the construction of a point. This "stream of consciousness" became a foundational characteristic of fiction in the modernist period, influencing the form of narration that writers such as Virginia Woolf and William Faulkner appropriate in their fiction. However, although these two writers rely on this technique rooted in William James's stream metaphor, the actual images of water in their books exceed James's characterization. In Woolf and Faulkner's novels, water's impenetrable stream gets broken; it floods the banks and lathers multiple individuals at once; it drowns and eats away at characters instead of acting as a constructive medium. Furthermore, these images accompany an expansion of James's thoughts on consciousness altogether, which intern informs Faulkner and Woolf's discussions of other social boundaries in their fiction.

18. Exploring The Elusive Complex

Zackery E. Moreau '21
Katie L. Nili '22
Cassidy C. Tran '23,
Bryan P. Dionisio '22
Samantha C. Rosenhagen '23
Asher T. Littlejohn '24
John A. Corbett '22
Christian Y. Kim '22
Chemistry
Dr. Allan Nishimura

Vapor deposition of biphenyl on AL_2O_3 AT 110 K is composed of biphenyl in the twisted conformation with a $\lambda_{max} \approx 320$ nm. Deposition at 138 k allowed biphenyl to overcome the activation barrier to planarity but was sufficiently amorphous to form excimer with a characteristic fluorescence $\lambda_{max} \approx 370$ NM. When a thin layer of cumene was deposited adjacent to the AL_2O_3 and beneath the biphenyl a new biphenyl peak with $\lambda_{max} \approx 315$ nm was observed during the TPD that appeared briefly at 147 K. This peak was identified as a complex of biphenyl and cumene whose composition depended on the conformer of biphenyl. The biphenyl:cumene complex was determined to be 3±1 biphenyl molecules to one cumene molecule if the biphenyl was deposited in the twisted conformation and 1.4±0.2 biphenyl to one cumene if the biphenyl was deposited in the planar form.

19. Within and Beside Memory: Navigating Identity and Solidarity as A Korean American Woman

Karis Cho '21
English
Dr. Paul Delaney
Dr. Kya Mangrum
Religious Studies
Dr. Holly Beers

As I consider what it means to be a woman who is Asian American, Korean American, bicultural, and a descendant of survivors of the Korean war, I work outside of the traditional boundaries of genre and form. I offer readings of photographs, Biblical lineages, my own lineage, Spotify playlists, Venn diagrams, Netflix documentaries, and academic articles to think about what Sadiya Hartman calls "losing your mother," or "losing your identity, your language, [and] your country." In other words, I reckon with what it means to live feeling insufficiently American and insufficiently Korean. In the literal sense, "losing your mother" refers to losing your mother to martyrdom (as my grandmother did) and the forgetting of my female ancestors' stories. From there, I engage in what Trinh H. Minh-ha calls "speaking nearby," an ethical alternative to "'speaking about' a culture outside your experience," as I consider solidarity between groups of Asian Americans and between Asian Americans, Black Americans, and Indigenous Americans.

20. Nationally Determined Contributions from The Paris Agreement: Examining the Relationship Between Social Vulnerability and Climate Change

Chloe Blish '21
Sociology
Dr. Meredith Whitnah

This paper examines the language surrounding global social disparities within each country's nationally determined contributions (NDC) in regards to the Paris Agreement . Through content analysis of each published NDC, the paper examines frequencies of specific words and interprets their social meaning within the documents, as well as noting the differences in use between developing and developed nations. As a part of the Paris Agreement, the United Nations framework convention on climate change (UNFCCC) emphasizes the role that social circumstances play in moving towards fair and sustainable climate change solutions. The presence or absence of words like vulnerability, socioeconomic, or poverty signify the country's commitment to eradicating social inequalities as a part of their climate change mitigation process. As the paper demonstrates the differences between developed and developing countries' NDC vocabulary, it contributes to our understanding of the deep connectedness of social and environmental issues.

21. Linear Polarization Measurements and Parity Determinations In ^{74}As

Daniel Staples '21
Physics
Dr. Robert Haring-Kaye

Recently, the decay scheme of the odd-odd arsenic-74 (^{74}As) nucleus was extended to high excitation energy, but most of the angular momentum (spin) and parity values of the observed excited states remain uncertain. Since then, the spins of many of these states have been measured, but without parity determinations. This lack of parity information has made it difficult to understand the underlying structure of ^{74}As, which shows significant differences with its neighboring odd-odd as isotopes. The goal of this work was thus to measure the parity of as many excited states in ^{74}As as possible in an attempt to better understand these differences. The ^{74}As nuclei were produced at high spin using the ^{62}Ni(^{14}C, *pn*) reaction at 50 MeV performed at Florida State University. Excited states decayed by γ-ray emission, which were detected by an array of 7 single-crystal Ge detectors and 3 Clover detectors. The Clover detectors were used to measure the linear polarization of γ rays, from which excited-state parities were inferred. The results of these measurements, along with their implications for the structure of ^{74}As, will be presented.

22. Black and Blue Lives: How Institutions Shape the Racial Attitudes and Beliefs Of Male Police Officers

Sarah Garland '21
Sociology
Dr. Meredith Whitnah

This paper examines how law enforcement influences individual police officers' attitudes and beliefs about racial groups, racial protests, and attitudes towards police brutality in the media. Following the death of George Floyd and the consequent protests in 2020, this study aims to better understand how police attitudes around race are influenced by their occupation. By conducting in-depth interviews with male police officers of various racial identities in the pacific northwest, this project finds factors such as residence in white normative environments, racial identity, time spent in the occupation, and responding to dispatch calls involving traumatic incidents (such as domestic violence, suicide, and active shooter scenarios), all contribute to police attitudes and beliefs about race--and the adoption of color-blind ideologies. In attending to complexities in the racial attitudes of police officers, this study contributes to our understanding of systemic racism, and suggests practical ways for reconciling relations between the police and the public.

23. Whose University? The Possibilities and Pitfalls of Antiracist Organizing In Higher Education

Brendan Fong '21
Sociology
Dr. Meredith Whitnah

The movement for Black Lives has ushered in a new era of protests against racial injustice including protests on college campuses. In 2015, a black student uprising at the University of Missouri sparked protests at universities across the nation. Drawing on social movement framing literature, this project analyzes seventy-nine lists of demands from protests in 2015 and 2016. Demands were coded to identify how student movements framed racial injustice (diagnostic framing), identified its victims, and proposed solutions (prognostic framing). The paper analyzes patterns of variation among identified victims of injustice and proposed solutions. This analysis reveals that demands rely on implicit rather than explicit articulations of the causal mechanisms behind systemic racism. I argue the observed variation highlights different factions within the movement, raises questions about the impact of campus organizing outside of the academy, and contributes to a gap in social movements literature on antiracist social movement organizations

24. Computational Study of The Electrophilicity Of Oxenium Ions

Trent Keeler '21
Chemistry
Dr. Brandon E. Haines

Oxenium ions, with a general structure r-o^{+}, are typically very unstable because they place a +1 formal charge on the electronegative element oxygen. Strategies to stabilize oxenium ions are of interest because of their potential as a source of electrophilic oxygen for chemical synthesis. Our approach is to append a Lewis-basic group in close proximity to the electron-deficient oxygen to stabilize intramolecular coordination. To estimate electrophilicity, we computed global and local electrophilicity parameters (ω and ω_k, respectively) using density functional theory (DFT) calculations, M06-2x/6-31G(d). Uncoordinated oxenium ions have large ω values (vinyl and phenyloxenium, ω = 7.5 and 13.6, respectively). Adding a coordinating amine lowers ω to ~3.3 for all of the studied oxenium ions, suggesting significant stabilization of the oxenium ion. Analysis of the ω_k values will provide a means to evaluate how the coordinating group affects which atoms are most electrophilic in the oxenium ions.

25. A Discourse-Based Intervention To Equip Caretakers To Build Student Resilience

Kyle Mayl '21
Communication Studies
Lesa Stern

Resilience, or adapting well in the face of significant stress, is an ability that college students ought to develop—especially in light of the global pandemic. Fortunately, parents and other caretakers can leverage certain communicative behaviors and encourage certain practices to promote their students' resilience. This project aimed to use a discourse-based intervention to equip caretakers with the resources necessary to cultivate student resilience. Flyers posted on a Facebook page geared toward caretakers offered research-backed resilience-building strategies like assigning responsibility, demonstrating warmth, and fostering a growth mindset in students. To activate caretaker communication as a means of boosting students' wellness in the midst of adversity, this project democratized short, intuitive versions of proven resilience resources.

26. The Borylation Of Aryl Sulfamates

Rachel Schulz '21
Maggie Hime '21
Marliss Neal '2
Chemistry
Dr. Amanda Silberstein

This project investigates novel methods of installing useful reactive handles for the formation of aryl-aryl carbon-carbon bonds. These types of bonds, which join functionalized rings, are ubiquitous in top pharmaceutical drugs on the market today. As such, this sector relies on well-established industrial methods for creating this bond via cross-coupling reactions, namely the Suzuki-Miyaura cross coupling[1], which utilizes a palladium catalyst and a boronic ester handle. To address the difficulty of installing boronic esters by traditional methods in the precursor step to cross-coupling, our research proposes a better method for making boronic esters from aryl sulfamates. The scope of our reaction method tolerates a wide range of substrates, but yields indicate that the method is best suited to electron-deficient aryl sulfamates with little steric hindrance near the reactive site. Successful synthesis of the aryl-aryl carbon-carbon compound diflunisal, a pharmaceutical drug that treats pain and inflammation, underpins proof of utility.

[1]Miyaura, N.; Suzuki, a. *Chem. Comm.* 1979, *19,* 866–867.

27. The Meta-Arylation Of Aryl Carbamates

Rachel Schulz '21
Maggie Hime '21
Marliss Neal '2
Chemistry
Dr. Amanda Silberstein

While there are many methods for the ortho- and para-substitution of aromatic rings, meta-substitution of aromatic rings remains a synthetic challenge. Our method uses a carbamate, a traditional ortho/para director, to direct the meta-installation of an aryl ring. Existing literature precedent for carrying out this method states that this is possible for N-aryl amides. Carbamates as directing groups have significant advantages, however. Carbamates are easily formed from readily available precursors, stable toward a variety of reaction conditions and can be used to further functionalize the aromatic ring as a directing group in known ortho/para substitutions or as a cross-coupling handle to substitute the carbamate. This research contributes greater understanding to the scope and synthetic potential for relatively new directing group chemistry. Moreover, it makes the previously largely inaccessible meta-substitution pattern for aromatic rings significantly more accessible. Two approaches to this transformation are explored, alternately using copper catalysis or palladium catalysis.

28. Learning Remotely: Does Self-Awareness Reduce Comprehension In A Virtual Learning Environment?

Brianna Gilman '21
Psychology
Dr. Ron See
Dr. Brenda Smith

Educational learning has been severely disrupted by COVID-19 and most institutions have adapted by transitioning to online learning using platforms like Zoom. However, online learning brings its own set of challenges. The current study examined the effect on comprehension of presented material while having one's own video on the screen during a lecture. The control group watched a 5-minute pre-recorded lecture while the experimental group watched the same lecture, but with their own video on the screen as well. Both groups answered a 10-question assessment on the material. Eye-tracking software determined the amount of time that participants looked at themselves compared to the instructor. Preliminary results suggest no difference in comprehension between the groups, but final results are pending. The results of this study could provide insight into how to make online learning more effective and potentially lead to further research into how the pandemic has affected classroom learning.

29. The Effect of Expectancy on Cognitive Performance After TMS Administration

Alice Solorzano '21
Psychology
Dr. Ron See
Dr. Brenda Smith

The current study sought to determine how participant expectancy in relation to the administration of Transcranial Magnetic Stimulation (TMS) can affect working memory as measured by individuals' performances on several cognitive assessments. It was predicted that the group with primed expectations would show an improvement in their ADAS-Cog score, compared to the control group. It was further hypothesized that the control group would not show any significant difference in cognitive improvement. A total of 37 college students participated and were randomized to the expectation group or a control group. Participants conducted a series of mental performance tasks through the administration of the Alzheimer's Disease Assessment Scale-Cognitive Subscale (ADAS-Cog) before and after receiving a single session TMS treatment. Preliminary results suggest that there was no significant difference in the ADAS-Cog scores when comparing the expectation group with the control group. However, preliminary results do indicate a significant difference between the baseline trial and the retest for the expectation group. Further data analysis and implications will be discussed.

30. Till We Have Faces: 3d Printing A Hexagonal Close-Packed Unit Cell For Chemical Education

Maisy Simmonds '21
Chemistry
Dr. Michael Everest

In order to support introductory chemical education at Westmont College, we created a 3D-printed model of the hexagonal close-packed (HCP) unit cell. The model was originally designed on the free, online 3D modeling program TinkerCAD and subsequently printed on a MakerBot Replicator+ 3D printer located on our campus. In the course of the project, we discovered that many commonly seen images of the HCP unit cell are incorrect. The HCP unit cell has three spheres arranged in a triangle in a second layer inside the cell. Some incorrect images give the impression that these spheres are entirely contained within the unit cell. However, each of these three spheres is actually intersected by the wall of the unit cell, resulting in six circular faces on the vertical walls of the cell: three spheres and three caps from adjacent cells. Our new accurate representation of the HCP unit cell can now be used in introductory instructional laboratory classes or in classroom activities.

31. Stability Analysis of Postural Control In Moderate-To-Severe Cerebral Palsy Using The Nyquist Criterion

Joe Lorentsen '21
Kinesiology
Dr. Adam Goodworth
Mathematics
Dr. Russell Howell

Through measuring subjects' stabilizing response to sitting on an unstable surface, we can use feedback control systems to create models of their body's stabilization system. Children with severe cases of cerebral palsy (GMFCS IV and V) are often considered unable to significantly improve their stability control, and are thus not given physical therapy. However, even a small improvement here can be a significant quality of life improvement. In order to tell if subjects are improving their torso control, we need to be able to describe and compare their relative stability system before and after treatment. My goal was to explore various methods of measuring stability of these feedback loop systems. I first tried plotting various parameters against each other to determine ranges of stability, but this proved inconsistent. However, using the complex analysis and the Nyquist Criterion, I was able to accurately plot and compare their stability.

32. How Gums and Starches Affect the Solubility of Calcium In Plant-Based Food Products

Morgan Alloway '22
Leila Parker '21
Chemistry
Dr. Michael Everest

In today's food industry, gums are commonly added to products to serve as binding and thickening agents as well as emulsifiers. For example, naturally occurring gums such as guar, locust bean, xanthan, gellan, tara, and acacia—all of which are polysaccharides—have all been used as food additives. Calcium is a dietary mineral supplement commonly added to plant-based foods for an additional source of this important nutrient. Starches derived from potatoes and peas are also important food additives. All of these food additives (gums, calcium, and starches) will possibly interact in complicated ways. In the present study, we investigated the effects of various gums, either in the presence or absence of starch, on the solubility of dicalcium phosphate, $CaHPO_4$. Calcium phosphate was agitated in water containing a variety of gums and starches, and the supernatant was collected and filtered. The solubility of calcium in each sample was determined with flame atomic absorbance spectrophotometry.

33. Variations on A Theme of Birdsong: A Novel

Laura Joy Phillips '21
English
Dr. Paul Willis

For English capstone, I have revised the opening chapters of a YA fantasy novel exploring themes of friendship, illness, and environmental consequences. For resources, I have primarily drawn on books about writing and editing, articles and videos on bird behavior, and mentor and peer feedback. While my revisions have ranged from adjusting plotlines to editing word choice, I have focused mainly on streamlining scenes, writing lively dialogue, and incorporating key details about setting and character. This semester has been an investigation into what makes the first chapters of a novel effective and compelling.

Novel summary: *When magical birds are hunted down for their healing powers, their absence plunges an entire island into a terrible epidemic, and an unlikely group must embark on a journey to bring the birds back.*

34. Effects of Oak Number and Distance On Acorn Woodpecker Social Behavior and Reproduction

Isabelle Hugoniot '23
Alexander Rurik '23
Biology
Dr. Amanda Sparkman

Human development is transforming natural environments, resulting in new challenges animals must face such as habitat loss and changes in resource availability. While some species have failed to adapt to the rapidly changing environment, others have found ways to thrive in urban locations. We tested for effects of resource availability on group size and reproduction of cooperatively-breeding acorn woodpeckers (Melanerpes formicivorus) in urban areas. We estimated the proximity of acorns, one of their primary food resources, by counting the number of mature (>25-75cm dbh) and old growth (>75cm dbh) California live oaks (Quercus agrifolia) within a 150 meter radius of woodpecker acorn-storage granaries. We predicted that granaries with longer flight distance to oaks would result in smaller group size and fewer fledglings. Our preliminary data suggests there was a significant positive relationship between number of fledglings and number of old growth trees, but no relationship between group size and oak number or distance.

35. Why Pyramids Become Triangles

Jason Joseph '21
Renn Duncan '21
Chemistry
Dr. Michael Everest

Ammonia's molecular geometry is known to be trigonal pyramidal, however, the molecule shifts to a trigonal planar geometry when a single electron is removed from its lone pair. That is, ammonia (NH_3) is a pyramid but the radical cation ($\cdot NH_3^+$) is a flat triangle. A similar geometric difference exists between tetrahedral methane (CH_4) and trigonal planar methyl radical ($\cdot CH_3$). In every case, the geometry that each molecule assumes is the geometry for which the total energy is minimized. However, the underlying reasons why there are such significant differences in the geometries of such similar molecules is not obvious. To investigate possible reasons, *ob initio* computational methods were employed to determine the energy of NH_3, $\cdot NH_3^+$, CH_3^-, and $\cdot CH_3$ as a function of geometry. The geometric dependence of the energy of each occupied orbital elucidates the reasons for the conformational changes.

36. How Likely Are Students to Know and Care About Health Disparities in the 10/90 Gap?

Brook Gauthier '21
Global Studies
Dr. Cynthia Toms

Global health research has a key role as a catalyst in the expansion of education, treatment, and prevention of the diseases that infect the global community. Experts within this field often refer to the 10/90 gap, an initiative aimed at increasing research for both infectious and non-communicable diseases as well as the development of effective treatments as having a key role to play in furthering equity in health care. Despite this important initiative, few students of medicine and health learn about this inequality in research and development (R&D) within their educational experience. Education and awareness building among the next generation of medical providers, technology and pharmaceutical innovators, and health researchers remains an important aspect of meeting the goals of global health equity. This study explores the awareness of pre-health students of global health disparities. The results of this study indicate a great probability that education and service project involvement have a key role in determining a student's knowledge of health disparities, specifically those within the 10/90 gap.

37. "Little Miss Ambassador:" Depictions Of Girlhood, Citizen Diplomacy, And The Late Cold War In The Work, Life, And Death Of Samantha Smith

Anastasia Heaton '21
History
Dr. Rachel Winslow

In July 1983, an 11-year-old girl from Manchester, Maine, Samantha Smith, became the "most famous child in the world" as she toured the Soviet Union as a citizen diplomat. Smith had written a letter to the president of the Soviet Union, Yuri Andropov, voicing her concerns about the possibility of nuclear war. To everyone's surprised, Andropov responded to Smith, an ordinary 5th-grader with no diplomatic ties whatsoever, inviting her to come visit the Soviet Union as a gesture of goodwill. Her whirlwind trip around the soviet union garnered substantial media attention, but was largely forgotten in the decades since and treated like an insignificant fluke by most cold war historians. This research seeks to use newspaper articles. Television coverage, and congressional documents to explore the dominant narratives that emerged in the media around smith's trip and subsequent life and work, demonstrating that through the media narratives espoused about her, smith offered a rhetorical alternative to "peace" through grassroots diplomacy and citizen activism to 1980s America, contributing to the influx of citizen diplomacy in the mid 1980s and directly helping end the cold war.

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