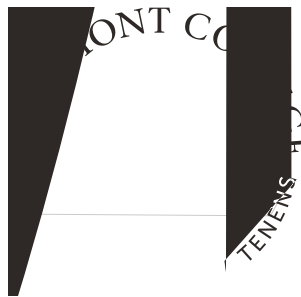




2021 Spring Research Symposium

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



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.

ABSTRACTS

1. *Community Education: Cultural Heritage*

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. *An African American History and Culture Festival*

ABSTRACTS

4. Experimental investigation of the structure of the odd-odd ^{70}Ga nucleus at high angular momentum (spin).

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 ^{70}Ga 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 $^{62}\text{Ni}(^{14}\text{C}, \alpha\text{pn})$ 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 Stress and Anxiety in Participants Exposed to a Cognitive Stressor.

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 ETEMCOg5 (AI). Based on the ETEMCOg5, which produced

ABSTRACTS

6. **E. J. F. BI C. A. I. I.**

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.



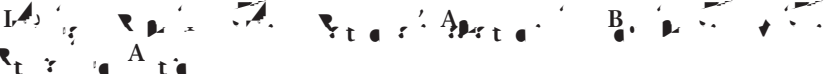
7. **H. A. D. A. C. A.**

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. **E. B. D. C. I. F. D. C.**

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 neurological 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

ABSTRACTS

11.  Kristen Mohrhoff '21
- 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.  Alexandra Ebert '21
- CAN and BAN have been developed as protected bisketene equivalents and can be used as dienophiles in Diels-Alder reactions with cyclopentadiene. Experimentally, BAN was found to be more reactive than CAN, so density functional theory (DFT) calculations were undertaken to understand this difference. A difference in the computed barriers between the CI 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 CAN and 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.  Emma Hoerauf '21
- 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.

ABSTRACTS

14. D. C. E. t. 3E. . . . A. . . .

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. E. . . . D. . . . G. . . . J. . . .

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.

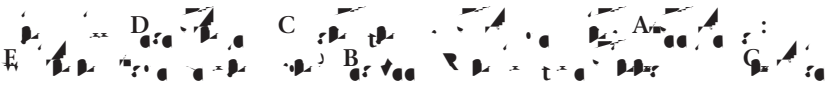
16. . . . C. . . . / β - E. . . .

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 uratedwaTmj..5969 215.6351 Tm01 vMp/MCf8 ()TJETEMC /P 0.

ct dfrancogr

factors on uratedAcWcyclic vinyl cations, uratedfinding β -Pj 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.

ABSTRACTS

20.  Musical notation showing a sequence of chords: E, D, C, B, A, G. Each chord is represented by a staff with notes and a chord symbol above it.

ABSTRACTS

24. C 

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)

ABSTRACTS

27. 


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.

Rachel Schulz '21

Maggie Hime '21

Marliss Neal '2



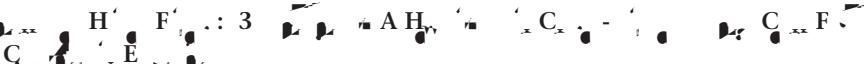
28. 

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.

ABSTRACTS

29.  Alice Solorzano '21

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.  Maisy Simmonds '21

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.

ABSTRACTS

31.

A
C
I
C

Joe Lorentsen '21

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.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

32.

H
G
A
C
I
B
F

Morgan Alloway '22

Leila Parker '21

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.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

33.

A
B
A

Laura Joy Phillips '21

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.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

Novel summary:

ABSTRACTS

34. E. B. D. A.

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 coopera-

ABSTRACTS

36. *Health Disparities in the 10/90 Gap?*

Brook Gauthier '21

Faculty Advisor: Dr. [Name]

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. *Amelia Earhart's Diplomatic Mission: A Study of the Cold War*

Anastasia Heaton '21

Faculty Advisor: Dr. [Name]

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 surprise, 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.

А. М. Т. Д. А. М. Т. Д. А. М. Т. Д.

310
0 - - 000