

# Undergraduate Research Scholars Symposium

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**Abstract Book**

**FEBRUARY 26, 2020**

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**Texas A&M University**



**LAUNCH**

**UNDERGRADUATE RESEARCH**

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# Symposium Schedule

Free & Open to the Public

## AM

9:00-11:15 | oral presentations

10:00-11:00 | poster presentations

## PM

1:00-4:30 | oral presentations

3:00-4:00 | poster presentations

## Student Voices

*“The URS Symposium was such a fantastic opportunity to present and grow as a student and as a part of the research community! The low-pressure environment made presenting less stressful and the support that was given by the active listeners was wonderful. I also enjoyed getting to share my experiences with the students who came to the presentation.”*

*“I liked that it was more laid back but still professional at the same time. I got a chance to explain my research to people who did not have a background in the field, and this was interesting when deciding what to say.”*

*“Low pressure environment. I got great feedback from faculty who've done this before and were very direct about exactly what they liked and what I could have done better.”*

*“I like that the active listeners gave constructive feedback and that they were polite and asking questions. I liked that the Symposium was open to everyone and that it gave a comfortable space to present. For being the first presentation for many of us, it was great that we felt comfortable in our own space.”*

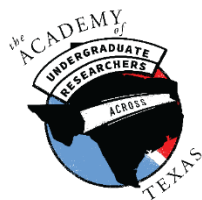
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# About the LAUNCH URS Symposium

The LAUNCH Undergraduate Research Scholars (URS) Symposium showcases undergraduate researchers in the Undergraduate Research Scholars thesis program. The URS thesis program provides undergraduates with a graduate student experience by allowing them to participate in research, produce a professional document, and communicate their findings as principal authors to the University's scholarly community. Learn more about the URS thesis program at <http://tx.ag/URSthesis>.

**The URS Symposium is free and open to the public.** Faculty, staff, post-doctoral and graduate students, as well as undergraduate students from all disciplines are encouraged to visit the LAUNCH URS Symposium to learn about numerous research projects being conducted on campus by undergraduates and discover ways to get involved in research at Texas A&M University.

## Special Recognition



The Academy of Undergraduate Researchers Across Texas (AURA Texas) is a community of elite student researchers at the two flagship universities in the state, and provides these exceptional students with networking opportunities, the chance to hone their professional skills, and a venue to discuss the importance of undergraduate research and the impact it has on their lives and in Texas. Through AURA Texas, LAUNCH: Undergraduate Research at Texas A&M University, College

Station, aims to strengthen the visibility of undergraduate research in Texas with our counterparts at The University of Texas at Austin and offices of Government Relations.

The third annual meeting of the Academy of Undergraduate Researchers Across Texas (AURA Texas) coincides with the LAUNCH URS Symposium. Members of AURA Texas from both Texas A&M University and The University of Texas at Austin will present research posters during the afternoon poster session in the MSC Bethancourt Ballroom. Learn more at <http://tx.ag/AURAtexas>.

## About LAUNCH

**LAUNCH is a unit of Undergraduate Studies in the Division of Academic Affairs under the Office of the Provost.** We are a collaboration of six teams that work together supporting students, faculty, and staff across Texas A&M University. Our programs are supported through student fees and generous contributions from the Association of Former Students and other contributors. Through community building, high-impact practices, personal and professional development opportunities, and the recognition of excellence, LAUNCH encourages all Aggies to expand their minds, take on challenges, dare to dream, and get involved. LAUNCH also joins the university community in making Texas A&M a welcoming environment for all individuals. We are committed to helping our students understand the experiences that make each of us unique and appreciate the shared values that bring us together. Learn more at <https://launch.tamu.edu>.

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# Presentation Listing

<b>Oral Session 1: 9:00 AM-10:00 AM</b> .....	<b>10</b>
<i>Room: MSC 2501</i> .....	<i>10</i>
Jordan Dunlap .....	10
Allison Barber .....	10
Farah Ramadan, Taha Kubbar, and Elizabeth Abraham .....	11
<i>Room: MSC 2502</i> .....	<i>11</i>
Taylor Nicole Torres .....	11
Chinaemere Ike .....	12
Jack Wang .....	12
<i>Room: MSC 2503</i> .....	<i>13</i>
Silvia Maria Navarro Valdez .....	13
Alexandra Bishop .....	13
Shachi Kulkarni.....	14
<i>Room: MSC 2504</i> .....	<i>14</i>
Valeria Hinojosa .....	14
Yanaiem Moreno .....	15
Xing-Han Zhang .....	15
<b>Oral Session 2: 10:15 AM-11:15 AM</b> .....	<b>16</b>
<i>Room: MSC 2501</i> .....	<i>16</i>
Brooke Thorson.....	16
Toluwani Ogunbayode .....	17
Elisabeth Catherine Riddle, Grace Bulkeley, Mercedes Rivera, and Naomi Noreen .....	17
<i>Room: MSC 2502</i> .....	<i>18</i>
William R. Black.....	18
Hannah McNease .....	18
Davis Beilue.....	19
<i>Room: MSC 2503</i> .....	<i>19</i>
Anna Grace Seguin .....	19
Dylan Siegers.....	20
Kyung Ho Jung.....	20
<i>Room: MSC 2504</i> .....	<i>21</i>

---

Alison Claire Vicary.....	21
Spencer Smith .....	21
Shrey Shah.....	22
<b>Oral Session 3: 1:00 PM-2:00 PM .....</b>	<b>22</b>
<i>Room: MSC 2501.....</i>	<i>22</i>
Beril Ulugun.....	23
Lloyd Donelan, Kishan Patel, and Brenton Lenzen .....	23
Katherine Hazel Miller .....	24
<i>Room: MSC 2502.....</i>	<i>25</i>
Gianmarco Antonio Calderara .....	25
Christopher Anjorin.....	25
Kelsey Lauren Pormasdoro .....	26
<i>Room: MSC 2503.....</i>	<i>26</i>
Gladys Pedraza .....	26
Duha Eldow .....	27
Jeremy Zheng.....	27
<i>Room: MSC 2504.....</i>	<i>28</i>
Jessica Myron.....	28
Cameron Wetzel .....	28
Fatima Al-Janahi and Rahul Balamurugan .....	29
<b>Oral Session 4: 2:15 PM-3:15 PM .....</b>	<b>30</b>
<i>Room: MSC 2501.....</i>	<i>30</i>
Kayla Richard.....	30
Kathryn Dorothy Pattison .....	30
Amy Lee Guzman .....	31
<i>Room: MSC 2502.....</i>	<i>31</i>
Jacob A. Espinoza-Stewart .....	31
Alexander Staggs.....	32
Giuseppe Rizzi and Ethan Galloway .....	32
<i>Room: MSC 2503.....</i>	<i>33</i>
John Heselton.....	33
Anna Renee Houk.....	33
Sunjay Letchuman.....	34

---

<i>Room: MSC 2504</i> .....	<b>34</b>
Andrew Chin.....	34
Marita Ann John.....	35
Jessica J. Garcia .....	35
<b>Oral Session 5: 3:30 PM-4:30 PM .....</b>	<b>36</b>
<i>Room: MSC 2501</i> .....	<b>36</b>
Amy Katharine Harbourne .....	36
Miguel Esparza.....	36
Zoe Allison Sherman .....	37
<i>Room: MSC 2502</i> .....	<b>38</b>
Sarah Stokes.....	38
Cora Garcia and Jordan Gomez.....	38
Donald Ray DuPont.....	39
<i>Room: MSC 2503</i> .....	<b>39</b>
Drew Jamal Samuelson Marks .....	39
Yuhan Zhang and Xuezhou Chong .....	40
Sarah Aboud.....	40
<i>Room: MSC 2504</i> .....	<b>41</b>
Jake Donohue.....	41
Caroline Wilson .....	42
Eric Nash .....	42
<b>Poster Session 1: 10:00 AM-11:00 AM .....</b>	<b>43</b>
<i>Room: MSC 2300 A-B</i> .....	<b>43</b>
Posters 1-10 .....	43
Pranali Haribhakti .....	43
Siddharth Sundar .....	43
Alexandra Yard.....	44
Madeleine Phillips.....	44
Jerahmeel Corbane Bautista .....	45
Madlyn Crist.....	45
Margaret Guy.....	46
Muhammed Zahid Kamil.....	47
Maryam Rashid S F Al-Buainain and Hassan Ejaz Haider .....	47
Gabriel Britain .....	48

---

Posters 11-20 .....	48
Monica Lam He .....	48
Lincoln-Abdullah Hasan El-Amin .....	49
Jonathan Innis .....	49
Hao Anh Nguyen .....	50
Mayur Bansal .....	51
Leen Taha Al Hamoud, Dana AlYafei, and Fatima Al-Khuzaei.....	51
Neeki Mostoufi.....	52
Ian Guang Xia .....	52
Christine Marie McCall.....	53
R. David Gafford-Gaby .....	53
Posters 21-30 .....	54
Sicong Huang.....	54
Jared Thome.....	54
Troy Fulton .....	55
Lindsey Pressler.....	55
Darryl Cherian Jacob .....	56
Hannah Marie Diaz.....	56
Arjun Krishnamoorthi.....	57
James Ethan Corban.....	57
Aksel Taylan .....	58
Alan Hurlbert.....	58
Posters 31-40 .....	59
Syeda Manahil Akhter, Hadeer Hassan, and Anurag Srivastava .....	59
John Wright.....	59
Mariah Barry .....	60
Tate Banks.....	60
Hannah Gooden .....	61
Dorothy Foster .....	61
Royce Yu.....	62
Daniel Schwartz and Hung Bui .....	62
Sumeet Singh and Saurabh Dhole.....	62
Sahil Patel.....	63
Posters 41-49 .....	64
Sarvesh Mayilvahanan .....	64



---

Ethan Park .....	64
Ellie Parker .....	65
Chloe Harrison .....	65
David Saucedo .....	66
Emily Bowlin, Taegan Besancon, and Adia Richardson.....	66
Ethan Morse.....	67
Ethan Vargas .....	68
Rachel Hage.....	68
<b>Poster Session 2: 3:00 PM-4:00 PM.....</b>	<b>70</b>
<i>Room: MSC 2300 A-B .....</i>	<i>70</i>
Posters 1-10 .....	70
Douglas Fletcher .....	70
Zaria El-Fil.....	71
Tory Martin .....	71
Simren Lakhota .....	72
Morgan James Chapman.....	72
Victoria Milosek .....	73
Ryan Randle .....	73
Andres Najera .....	74
Natalie Coleman.....	75
Jamie Chuvalo-Abraham .....	75
Posters 11-20 .....	76
Faris Zaibaq .....	76
Nariko Nakachi.....	77
Francisco Anaya, Jr.....	77
Youngjun Park .....	78
Lina Zhang .....	78
Alexi Allen .....	79
Michael Tang, Aaron Kim, and Mitchell Hsu.....	79
Ashley Driscoll.....	80
Mayra Gonzalez .....	81
Andrew Nakos.....	81
Posters 21-30 .....	82
David Dishman .....	82
Carter Lehman .....	82



---

Stacy Nunez, Dania Muhammad, and Patrick Hall.....	83
Cassidy Hale .....	83
Payton Blackburn .....	84
Louis Anthony Cadena .....	85
Sheyenne Davis .....	85
Demonta Devone Coleman.....	86
Srishti Kumar.....	86
Aashish Ananthanarayan .....	87
<b>Posters 31-40 .....</b>	<b>87</b>
Marie Antoinette Chapa .....	87
Shuaifang Wang .....	88
Alex Peters .....	88
Michael Erickson .....	89
Irvin Claudio .....	89
Zachary Newell.....	90
Kristen Akin .....	90
Karthik Rao.....	91
Keland Moore .....	91
Isabella J. Huddleston .....	92
<b>Posters 41-49 .....</b>	<b>92</b>
Emily Rayer.....	92
Feras A. Khemakhem .....	93
Eric Lloyd Robles .....	93
Jacquelyn McCullough .....	94
Sagar J. Patel .....	95
Jose Israel Morales, Madison Poe, and Rachel White .....	95
Joslyn Cavitt .....	96
Nicole DePadova and Mahi Basra .....	96
Carmen Sims .....	97

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# Oral Session 1: 9:00 AM-10:00 AM

Room: MSC 2501

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## *Public Law 280, Tribal Sovereignty, and the Value of Sovereignty*

**Jordan Dunlap**

Glasscock Summer Scholar

*Faculty Advisor: Dr. Linda Radzik*

In 1953, Congress enacted a federal statute that transferred jurisdiction over tribal nations from the federal government to the state governments in six states with a piece of legislation known as Public Law 280 (PL-280). In the first portion of my essay, I will provide a definitional basis of PL-280 and the doctrine of tribal sovereignty for the reader. In the second section of my essay, I will define what it means to be sovereign. In other words, I will attempt to come up with an account of what the concept of sovereignty is. The completion of this task will enable me to move into the third and final section of my research. It is in this section that I will endeavor to put forth an answer to my initial research question: Does PL-280 violate contemporary notions of sovereignty? In the final part of my essay, I will interpret the significance of these findings. I will begin by challenging the requirements that were once assumed to be necessary for sovereignty to exist, namely, jurisdiction, the ability to give consent, and the right to self-determination. These three abilities have been altered for tribal nations affected by PL-280. After this is completed, I will explore the value of sovereignty and what the contemporary application of this concept actually looks like. This will be done through the lens of tribal nations, a group of people for whom consideration has not been always been given when examining the philosophical underpinnings of sovereignty. In other words, most theories of sovereignty have been developed in response to the political histories of European nations and have tested the conditions of sovereignty against the activities of those nations, while there is a small amount of literature that upholds the conditions of tribal sovereignty.

## *The Use of Criminal Interrogation Methods within a Post-Modern America*

**Allison Barber**

*Faculty Advisor: Dr. Stjepan Mestrovic*

Post-modernism affects and explains the use of interrogation methods in American military court-martial investigations. Through this research, I apply post-modern concepts to typical interview and interrogation techniques, which will illuminate some of the controversies surrounding the use of the methods. I have found that, because of post-modernism, the distinction between right and wrong in the interrogation room has been blurred. The use of these techniques is ubiquitous in all United States police departments as well as military investigations, and most use psychological tactics to make the interviewee incriminate themselves. These techniques are controversial methods, and some are banned

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in Canada, the United Kingdom, and Australia where they are seen as a form of coercion. However, in a post-modern America, a confession continues to be regarded as the highest form of proof known to law. Specifically, the cases that I will be analyzing show that the techniques use deception to bring about a confession, regardless of the facts of the case. It is important to note that none of these techniques can be finally and ultimately reduced to any one, single, method of interrogation or interview.

### *Towards Carbon Neutral Industrial Parks*

**Farah Ramadan, Taha Kubbar, and Elizabeth Abraham**

Texas A&M University at Qatar

*Faculty Advisor: Dr. Dhabia Al-Mohannadi*

CO<sub>2</sub> emissions from industrial processes adversely affect the environment, with significant contributions to climate change. Therefore, there is a global need to reduce CO<sub>2</sub> emissions into the atmosphere. Through this work, a tool that optimizes energy reuse while reducing emissions and maximizing profit was applied to an industrial cluster made up of several plants and/or processes producing several different products. There has been a recent focus on carbon capture utilization and storage solutions that integrate natural gas, energy, and other key materials like CO<sub>2</sub>. This work introduces an integration approach to design a carbon neutral industrial park from resources such as natural gas, water, air, emissions, and energy as heat and power, to produce value-added products. The approach applies a Linear Program (LP) that can be applied to various combinations of plants, to find the optimum configuration for a set target. An illustrative example that explores different target scenarios and combinations was investigated to verify the approach.

**Room: MSC 2502**

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### *Latinx Political Engagement and the Effects of Executive Level Action*

**Taylor Nicole Torres**

*Faculty Advisor: Dr. Brittany Perry*

How have recent forms of executive level actions in the United States affected political engagement across the Latinx community? This project will extend upon previous research stating that executive level action and policies influence political engagement. More specifically, this research will focus on recent forms of executive level action from the most recent Administrations that pose an external threat to members of the Latinx community. I expect that threat will serve as a mobilizing factor for the Latinx community due to the emotional responses that members of the Latinx population feel as a result of these executive level actions. Additionally, I expect that the Latinx population will exhibit a sense of linked fate, and when one group mobilizes, the rest of the population will follow suit and mobilize as well. This project will rely on previous research from the Obama and Trump Administrations. These two

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Administrations will be contrasted based on the threat that their executive actions posed to the Latinx community during their presidency, as well as the level of political engagement from the Latinx population during this time. Additionally, in order to account for more personal statements and variance, this project will rely on interviews from individuals that are either members of Latinx grassroots organizations in Texas, or members of Latinx organizations on Texas A&M's campus. These interview results will then be compared to previous data and surveys on Latinx political engagement to determine the Latinx response to threat in the form of executive level action.

### *Voice Recognition and African Accents*

**Chinaemere Ike**

*Faculty Advisor: Dr. Tracy Hammond*

The goal of this research is to design an algorithm to help voice recognition speakers detect accents from Africa. With new age speakers such as the Echo Dot and Google Home, everyone should have equal opportunity to use them. My research project differs from research done before me because yes, these speakers cannot detect every dialect or accent. Yet, the only accents that have been tested are ones from Europe, Latin America and Asia. Accents from Africa and the Caribbean were not included in every paper I read. My research project can help developers include accents from the African diaspora when updating the speakers. The addition of African accents can potentially diversify smart speaker customer bases worldwide. I expect that after collecting audio files from different voices across the African diaspora, I will be able to develop an implementation for current voice recognition systems.

### *How do National Election Outcomes Affect International Relations? A Case Study of Taiwan, China, and the United States.*

**Jack Wang**

*Faculty Advisor: Dr. Alex Pacek*

This thesis will look to comparatively analyze the main Taiwanese Presidential candidates, examine Taiwan's past election patterns and surrounding political discourses, and discuss the political and economic implications of the Taiwanese elections for Taiwan, China, and the United States. Taiwan's disputed political status along with the current power competition between the United States and China provides an appropriate study to show how in an increasingly globalized world, elections don't just affect the country itself, it can affect the global order and certain facets in international relations.

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## Room: MSC 2503

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### *The Role of Servant Leadership in Human Resources Management and its Relation to Issues of Diversity*

**Silvia Maria Navarro Valdez**

*Faculty Advisor: Dr. Charles Conrad*

This project will investigate the uses and limitations of servant leadership in human resources management practices. Because of the platform that the human resources management position has in the hiring process, group orientations, and enforcement of company rules and regulations, this is a key role in shifting the corporate culture of a company. The reason that this research differs from previous research that has been done in the field is because I am looking into how the practices of HRM have the power to influence intercultural communication within the organization, overall organizational culture, and organizational productivity. Because of the vital role that HRM has, I want to see how servant leadership can further aid in meeting an organization's goals, and in meeting the needs of Hispanics in the workplace. There has been recent research that challenges the notion that HR serves the needs of employees, but is instead an instrument of managerial control. This research is important because (1) Managerial practices should continually be challenged and improved upon and (2) Hispanics are the "majority minority," so it is important that we are constantly looking for ways to understand their position, and adapt practices within organizations accordingly. My expected outcome is to find tangible ways to effectively interlace Human Resources Management and servant leadership in order to improve the overall culture of organizations.

### *In Search of the Proximate Factors Triggering Anthrax Epidemics: Simulation of Plasmid Transfer and Persistence in Bacillus Communities Outside of the Host*

**Alexandra Bishop**

LAUNCH Undergraduate Research Ambassador

*Faculty Advisor: Dr. Hsiao-Hsuan (Rose) Wang*

A bacterial infection popularized through bioterrorism, anthrax is a potentially fatal illness. *Bacillus anthracis*, notoriously the causative agent of anthrax, exists in community with hundreds of other species of bacteria in the environment, and is known to harbor in the rhizosphere of grass roots. Recent work done on the genetics of these communities has shown that *B. anthracis* shares a very high percentage of chromosomal genes with both *B. thuringiensis* and *B. cereus*, and that phenotypic differences between the bacterium results from extra-chromosomal DNA, usually plasmids. Therefore, the ability of *B. anthracis* to produce anthrax toxins is transmittable to other bacterium within its community, under the correct conditions. Following a literature review, I aimed to develop a model of bacterial conjugation within the *Bacillus* genus. I developed a spatially-explicit, individual-based, stochastic simulation model using NetLogo, an agent-based modeling language, for investigating the

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likelihood of detecting plasmids with genes encoding anthrax toxins within bacterial communities composed of *B. anthracis*, *B. thuringiensis*, *B. cereus*, and the surrounding matrix of extra-cellular polymeric substances. Preliminary simulation results indicate that the model shows promise as a simple, useful representation of the pertinent characteristics of the system of interest, and confirm the potential of the horizontal transfer of plasmids with genes encoding anthrax toxins among *Bacillus* species persisting outside the host as a proximate factor triggering anthrax epidemics.

## *Media Choice and Political Participation*

**Shachi Kulkarni**

*Faculty Advisor: Dr. Robert Harmel*

The relationship between media consumption and political participation should be different in that those who use commercial sources of information in the Netherlands are less likely to be politically active. However, those in China who seek out commercial sources of information from around the world could be more likely to be politically active due to the time and effort they put in to find uncensored sources of information. Government sponsored sources of information are the main source of news for many Chinese citizens due to the strict government control of news and information. In a democratic country such as The Netherlands, there are public and private options for news sources that are all freely available. This makes the private news sources have to compete for viewership and customers by selling negative stories that are sensational, which could affect the readers' inclination to participate in politics negatively, while those living in China do not have the same level of access to commercial sources. Because of this, it is expected that only those who have a desire to do the work to seek out private sources of information will do so due to the fact that they are harder to find in that country.

## **Room: MSC 2504**

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## *A Targeted Experience: How Presidential Rhetoric Influences Relations Between Police and People of Color*

**Valeria Hinojosa**

*Faculty Advisor: Dr. Brittany Perry*

The current political administration has been deemed to be one of the most racially charged administrations in history. President Trump has been accused of "pushing an anti-immigrant hate into the mainstream" and criticized for his rhetoric that seems to "fuel white supremacy" (Beirich, 2019). He has been criticized for using the "bully pulpit" which in turn has shaped a country's entire attitude on people of color. This project aims to analyze how the current political rhetoric influences the relations between police and people of color. I argue that political rhetoric has a strong influence in any and all encounters of police and people of color. Due to the ongoing political hostility, both police and people of color, have preconceived ideas of each other which in turn creates a recipe for disaster and oftentimes,

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fatal results. In my project, I observe how these attitudes are shaped, their effects and how we can change them moving forward. To do so, I plan to draw on existing data to accurately depict the power of political rhetoric. Once the influence of political rhetoric is established, I plan to look at the current relations between police and people of color. To do this, I will look into past encounters between the two parties which are police and people of color and compare outcomes. My findings will suggest that presidential rhetoric at the executive level plays a huge role in the encounters of local police departments and citizens which in turn can help to infer that a change in political rhetoric will cause a direct change in the relations of the aforementioned parties.

### *Incentives to Invest: The Case of Mexico*

**Yanairam Moreno**

*Faculty Advisor: Dr. Amy Pond*

When assessing how political representatives mitigate the risk of violence for foreign investors, it is crucial to understand the profound role Mexico has in the international market. For the past two decades, Mexico has been a major exporter and importer to the world economy—specifically to the United States. As of 2017 Mexico is ranked 15th in the highest foreign direct investment (FDI) inflow. This has caused a rapid increase in development in the country. Moreover, it is also important to mention that in the past two decades organize crime/violence has been an ongoing issue for the country. There has been diverging sides when discussing if FDI is negatively affected by the violence. Because of this, it is important to take a closer look at exterior conditions- political incentives. Political incentives are benefits given to firms, usually economic advantages, by the current government Through my research, I plan to further identify reasons investors choose to invest in violent regions. Most specifically on the different ways Mexican political representatives mitigate the risk of violence for foreign investors. In addition, to find if these incentives benefit the region's economic development.

### *The Therapeutic Potential of a Natural Compound Derived from Cruciferous Vegetables for Resistant ER-Positive Breast Cancers*

**Xing-Han Zhang**

*Faculty Advisor: Dr. Stephen Safe*

Estrogen receptor alpha (ER $\alpha$ , ESR1) expressing breast cancers initially respond to endocrine therapy, however later stage ER-positive tumors develop drug resistance and second-line therapies including selective ER degraders (SERDs) are being developed. Tumor resistance is due, in part, to mutations in ER $\alpha$  that render it constitutively active, and SERDs directly bind ER $\alpha$  and induce its degradation. It has previously been shown that 3,3'-diindolylmethane (DIM) derived from cruciferous vegetables such as broccoli and Brussels sprouts exhibits a similar activity of degrading ER $\alpha$  in MCF-7 breast cancer cell lines, and this is mediated by the aryl hydrocarbon receptor (AhR) and the proteasome system. However, whether DIM is capable of degrading mutated ER $\alpha$  is an area of investigation that we have pursued in this study. Approximately 40% of late-stage metastatic ER-positive breast tumors express the



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ER mutations Y537S or D538G in the ligand-binding domain of ER $\alpha$ ; therefore, MCF-7 cells expressing these mutations generated by gene editing technologies were used in this study. Treatment of wild-type and Y537S or D538G mutant MCF-7 cells with DIM resulted in decreased ER $\alpha$  protein expression with increasing dose and time, and decreased cell proliferation was also observed with increasing concentrations of DIM. Moreover, ER $\alpha$  was rescued from degradation in each cell line if the specific proteasome inhibitor, MG132, was co-administered with DIM. Thus, DIM exhibits promising therapeutic potential in resistant cases of ER-positive breast cancers as a novel SERD, and current efforts to advance DIM into a clinical trial are underway.

## Oral Session 2: 10:15 AM-11:15 AM

Room: MSC 2501

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### *The Woman Question: The Lasting Legacy of Coeducation at Texas A&M University*

**Brooke Thorson**

*Faculty Advisor: Dr. Sarah McNamara*

The history of women at Texas A&M is relatively unknown both within and beyond the university. Stories that do recount this history focus on the maternal nature of women as wives of faculty and students and their contribution to the university as members of wives' clubs. The slow trickle of women into the university is a subject worth examining— not just for the posterity of university history but because it tells a different yet important story of the 1960s. While students at other universities embraced the free speech movement, protested the Vietnam War, and battled segregation, A&M's student movement took a distinct form of anti-coeducation. While this student movement may not have been noteworthy in comparison to the other student activism movements in the 1960s and 1970s in the United States, it would have lasting effects on Texas A&M. Arguments against women's admission into Texas A&M University are part of a bigger story that shows how essential the movements for coeducation were changing the social fabric of the United States. Many other universities in the United States went through a sexual revolution or student activist movements in which many traditional policies were removed to allow for a more inclusive university. However, Texas A&M never had a progressive movement. Consequently, without this upheaval, many male-centric traditions and policies remain in place at the university and women sit on the sidelines to traditions they were never meant to be a part of.

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## *Determining the Factors Affecting the Growth of the Land Value in the Greater Dallas–Fort Worth–Arlington: Focused on Residential Land Value*

**Toluwani Ogunbayode**

*Faculty Advisor: Dr. Senarath Dharmasena*

Residential land value in Texas has been growing over the past twenty years. In particular, greater Dallas–Fort Worth (DFW)–Arlington area has shown a substantial growth in residential land value. However, the causes that might have contributed to this growth in this land value are as numerous as they are varied. This paper examines the issue of continuous rising prices of residential lands in greater DFW–Arlington area and generates determining causes. Cutting-edge machine learning and graphical approaches are utilized to analyze complex interactions of various factors determining the growth of this land value. Knowing the factors that determine the land value will help various stakeholders in the industry to make better-informed decisions with regards to land transactions. Preliminary investigation into data reveals that factors such as personal disposable income, net migration, availability of recreational, entertainment and sporting facilities, growth of restaurants, and growth of major roadways have jointly contributed to growth in residential land value on greater DFW–Arlington area.

## *Improving Knee Alignment in Dancers with Hyperextension: Quadricep Strengthening vs. Practicing and Cueing*

**Elisabeth Catherine Riddle, Grace Bulkeley, Mercedes Rivera, and Naomi Noreen**

*Faculty Advisor: Dr. Carisa Armstrong*

The purpose of this study is to identify the most effective method to correct a dancer's hyperextension at the knee joint. Many dancers have knee hyperextension, which is defined as the ability for their knee to extend past 180°. This causes this joint to become unstable as dancers' reliable functionality decreases as the knee extends past 180°. The instability can cause a range of ligament injuries and provide a base for alignment issues. The majority of dancers are not aware of their hyperextension until they enter a collegiate level dance program. After years of training in hyperextension, it is difficult for the dancer to relearn where their true straight leg position should be. This study includes a control group, a strength training group, and a cueing group. The control group participated in pre and post testing and continued regular weekly activity. The strength training group performed exercises 3 times a week for 6 weeks targeting the quadriceps, hamstrings, and rotator muscles. The cueing group performed ballet combinations 3 times a week for 6 weeks that are focused on controlling instability of the standing leg while being provided internally and externally based verbal cues to give them different ways to think about correcting their knee hyperextension. Both intervention groups are monitored during their training to evaluate proper alignment and engagement. The pre and post testing included measuring passive and active knee hyperextension, video analysis of dance movements focusing on the standing leg, and a survey where the dancer can self-report on their perceived level of success in correcting hyperextension at the knee. The expectation is that the cueing group will have a greater level of success in correcting knee hyperextension in their technique.

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## Room: MSC 2502

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### *The Effects of Gender of a Jury Member on Verdicts and Punishment*

**William R. Black**

*Faculty Advisor: Dr. Nehemia Geva*

Literature Review: The literature review is thematically separated in three ways. Those three ways being the history of women who have been executed in the United States, Scientific Jury Selection being questioned, and Scientific Jury Selection working. Thesis Statement: I present an understudied question that has practical relevance as well as theoretical value when we try to understand how members of the public implement/apply their moral/legal values at the extreme cases such as ones that involve the death penalty as a punishment. Theoretical Framework: The "Evil Woman Theory" suggests that a woman is excluded from her social location if she commits a crime so heinous that a woman would never be expected to do that. The "Chivalry Theory" suggests that a woman can do no wrong because she is within her social norm. Project Description: This research investigates the effects that gender has when the death penalty is a possible punishment for someone found guilty of murder. Using literature that covers the theoretical aspect of this process, this research will test to see if the theories from the literature can be applied in practice. Opinions change, so this research serves an additional purpose of updating the world on what the current position(s) appear to be after collecting and analyzing the results from an experiment.

### *Thief of Flesh*

**Hannah McNease**

Aggie Creative Collective

*Faculty Advisor: Dr. Jason Harris*

This thesis contains research conducted to guide the writing of my novel entitled *Thief of Flesh*, in which a short-tempered and socially inept youth named Elijah is overtaken by a cannibalistic Wendigo spirit following ostracization by his peers. The story follows his decline into something inhuman, as well as the vastly different paths two other characters, his mother Nell and stepfather Sam, take to figure out what is going on and how to solve it. This novel seeks to explore the depths of human emotion and actions, specifically those that result from trauma and love and how they affect individuals. Research shows that intensely negative moments in life can cause extreme psychological stress that can alter a person into something they weren't before and in some cases lead them to perform actions outside of the normal bounds of broadly-expected morality, which will be explored through the viewpoints of Elijah and Nell. Further, close familial and relational bonds have been found to similarly warp the way people act toward their loved ones, causing them to go to great lengths in order to protect them or blinding them to the negative actions their loved ones may perform, which will be explored through the viewpoints of Nell and Sam. In culmination, this novel and the three perspectives seek to provide a better understanding of human emotions and how they shape one's actions.

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## *Defending Against Quantum Attackers*

**Davis Beilue**

*Faculty Advisor: Dr. Fang Song*

The world of computing looks to propel itself into a new age with the progression of quantum computers and their growing capabilities. With these new capabilities come new threats, especially in the world of cryptography. Modern encryption schemes are built upon mathematical concepts that have proven difficult for today's computers to solve instances of. However, studies over the past few decades have proven that a fully-realized quantum computer will not find all of these things difficult. What does this mean for the world outside of academia? This means the privacy of every person and entity could be at stake if no preparations are made in anticipation of the fully-realized quantum computer. Preparing for this threat means having cryptographic standards understood as much as possible with schemes ready for implementation. This preparation is being regulated by organizations such as the National Institute of Standards and Technology (NIST) who has requested that research teams all over the world submit their ideas for encryption methods and standards so that the community as a whole can collaborate through analysis, critiquing and learning from them, in turn pushing progress forward at a faster pace. In this paper, I take up this mantle of analysis and will discuss the results from a select number of schemes.

## **Room: MSC 2503**

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## *A Catalogue of Wings*

**Anna Grace Seguin**

Aggie Creative Collective

*Faculty Advisor: Dr. Sara DiCaglio*

What does form do for the way creative nonfiction is read, and what effect does it have on our ability to express narrative truth? Many definitions of creative nonfiction have understood the genre as dedicated to communicating truth. However, contemporary writers of creative nonfiction often create narratives that bend the rules of genre. If nonfiction must express truth, then its very form must contribute to its believability. As some experiences or emotions may be true, but also fall outside of language, the way in which we write and understand truth cannot be so absolute, and the forms of creative nonfiction cannot be limited to one method. By researching and creating hybrid essays that experiment with form, I will explore what makes narrative truth, and whether formal decisions change the way something is true. This work builds upon previous work on the idea of hybrid genre and lyric essays. I approach the ideas of beauty, longing, and loneliness through experimental essay to see how form affects the understanding and expression of the truths of these ideas. The topics of these essays—loosely organized around the ideas of beauty, longing, and loneliness—are particularly worth exploring through hybrid forms because

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they rely heavily on the experiences of the reader. Feelings do not lend to absolute truth, and therefore, reading an essay with the intention to define the feelings absolutely is futile. Opening the narrative through the opening of form allows these ideas to exceed any kind of argument one might be trying to or wanting to make. This allows the words to go beyond simple language and definition into the realm of emotional intelligence, where ideas may be understood on a different plane.

## *Improving Memory Management in the Linux Kernel*

**Dylan Siegers**

*Faculty Advisor: Dr. Chia-Che Tsai*

In this research I intend to analyze the Linux OS memory management system for inefficient corner cases and work to improve the source code to decrease the inefficiency. This is primarily important due to the nature of the Linux kernel being a constantly developing project. This operating system is extremely prominent in the field of computer science, and is always being improved, however most of these improvements come from academia, not industry. This makes it important to spend resources researching and continuing the process of perfecting this large body of code. There is an expanse of previous research on the Linux kernel in general, but the purpose of my research is to build on or improve the work of what has been done before. This is accomplished by looking at the composite of all the research of others (the Linux kernel as a whole), and adapting it to be more efficient in certain situations. The outcome I am aiming for is just that, locating and altering specific cases of the code to allow for a greater efficiency of the OS as a whole.

## *The Effect of Stimulating and Disrupting the Adiponectin Signaling Pathway on Plasma Membrane Rigidity*

**Kyung Ho Jung**

LAUNCH Undergraduate Research Ambassador

*Faculty Advisor: Dr. Robert Chapkin*

Cancer and obesity are two major health concerns in the 21st Century. 1,735,350 people were diagnosed with cancer in 2018 alone and 160 million people are either obese or overweight in America. Because cancer is the second most leading cause of death in America and approximately 7% to 8% of all cancer cases and deaths in the United States are attributable to obesity, it is critical to understand the mechanisms between cancer proliferation and obesity. If we take a more microscopic approach, cancer proliferation and obesity have a common biophysical phenotype of interest. The plasma membrane of cells serves as a nexus integrating intracellular components that enable various fundamental cellular signaling. Numerous researches show that alterations in membrane homeostasis due to various stimulations can cause obesity-linked inflammation, metabolic disorders, altered T cell responses, and cancer proliferation. With regards to colorectal cancer, our lab has previously shown that obesity can promote colonic stem cell expansion, resulting in cancer initiation. Furthermore, adiponectin, which is down regulated in obese individuals, could be a key link between obesity and colorectal cancer. With

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the consensus that low circulating adiponectin levels, due to increased obesity, present a risk factor in cancer initiation, it is pertinent that the mechanism by which adiponectin signals through its respective receptors be determined. Here we demonstrate that AdipoRon, a small molecule adiponectin receptor agonist, decreases membrane order in a dose dependent manner in WT HAP1 cells. Moreover, we show that disrupting adiponectin signaling by knocking out either or both adiponectin receptors changes the rigidity of the plasma membrane.

## Room: MSC 2504

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### *Coa4 Is Required for Copper Delivery to Cytochrome C Oxidase*

**Alison Claire Vicary**

*Faculty Advisor: Dr. Vishal Gohil*

Copper is required for the assembly and activity of cytochrome c oxidase (CcO), the terminal enzyme of the mitochondrial respiratory chain. As CcO is a multi-subunit metalloprotein, CcO biogenesis involves many assembly factors necessary for the proper association of protein subunits and insertion of cofactors. Although the existence of these assembly factors has long been known, the precise biochemical roles of many of them have remained unknown. Here we investigated the role of Coa4, an evolutionarily conserved CcO assembly factor with unknown function. We found that COA4-knockout yeast cells have a respiratory growth phenotype correlated with impaired CcO assembly and activity, as well as reduced mitochondrial copper levels, all of which can be alleviated by exogenous copper supplementation. These results suggest that disrupted copper transport to CcO is the biochemical basis of the respiratory deficiency of COA4-knockout cells. Copper delivery to CcO occurs in a bucket brigade fashion via copper delivery pathway proteins. To place Coa4 in the copper delivery pathway, we performed a candidate-based suppression screen with 15 genes implicated in CcO assembly. Overexpression of COX11, a metallochaperone involved in copper delivery to the CcO subunit Cox1, rescued the respiratory growth of COA4-knockout cells, suggesting that Coa4 acts upstream of Cox11. The sub-mitochondrial localization and sequence analyses of Coa4 suggested a redox role in the copper delivery process. In support of this idea, we found that glutathione supplementation and hypoxia treatment each rescued the respiratory growth of COA4-knockout cells. Taken together, these results uncover a redox role of Coa4 in the copper delivery pathway to the Cox1 subunit of CcO.

### *The Effect of the Trump Tariffs on Major US Trade Partners*

**Spencer Smith**

*Faculty Advisor: Dr. Craig Schulma*

The research question I am pursuing is how the aggressive trade tariffs that the United States has put in place has affected trade partners such as China and Mexico. I am specifically addressing the tariffs on steel and aluminum, and the tariffs that other countries have placed on the US in turn. My research

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goals are to further understand and document the impact that the Trump Administration's tariffs and "trade war" has had on countries such as China and Mexico. During the Trump Administration, the United States began to place tariffs on countries such as Mexico and China for varying reasons. These countries retaliated with more trade tariffs and a trade war began to develop. My research goals are to further understand and document the impact that the Trump Administration's tariffs and "trade war" has had on countries such as China and Mexico. During the Trump Administration, the United States began to place tariffs on countries such as Mexico and China for varying reasons. These countries retaliated with more trade tariffs and a trade war began to develop. The United States and China are two of the largest trade partners in the world, and tariffs on both imports and exports between the countries will have a noticeable and measurable economic impact. This research will specifically address some of the largest tariffs put in place between the largest trade partners. Such research will come alongside existing research to better understand the impacts such tariffs from a trade giant can have on the world. Alongside having political and relational impacts on the world trading floor, the "trade war" that the United States has entered into with many countries has noticeably changed the economic theatre of both imports and exports for those countries.

### *Accurate Identification of Dynamic Objects Using Data Overlay Between Radar and Camera*

**Shrey Shah**

*Faculty Advisor: Dr. Dezhen Song*

Self-driving cars are no doubt the future of commute for the world and it is paramount to make them as safe as possible on the road. The paper will cover a start to end process of making a system to easily collect data from the radar and camera and then using algorithms on the data collected to reduce anomalies and detect objects with better accuracy. Radar and camera both act as a data input for self-driving cars and are extremely important for the safety of both, the passengers, and pedestrians, however, both of these can be easily fooled. The advantage here is that what deceives one of the devices doesn't always mislead the other one, hence, using the suitable traits of each to overcome the deficiencies of the other will make them more robust and less susceptible to be fooled by such anomalies. By the end of this paper the reader will have an in-depth understanding of how data is taken in, manipulated and converted into results that power a self-driving car.

## Oral Session 3: 1:00 PM-2:00 PM

Room: MSC 2501

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## *Ultra-Durable Anti-Fouling Water Repellent Coatings for Healthcare Applications*

**Beril Ulugun**

*Faculty Advisor: Dr. Mustafa Akbulut*

Infections that acquired at the hospital at the fourth leading cause of death in the United States' while they affect annually 10% of American hospital patients. Biofilm which is grown on the surfaces of medical devices and tools causes 65% of these nosocomial infections. Therefore, it is important to take preventive measurements for biofilm/bacterial attachment on the surfaces before they form to reduce the need for therapeutic treatments. Our work intends to improve hygiene while making the cleaning process easier on surfaces that are present in healthcare environments by developing an ultradurable coating that possesses superhydrophobic and anti-fouling properties. Nanodiamonds are used as the main component of this coating to provide the required surface topography in nanoscale and to increase mechanical durability. The unique surface of nanodiamonds with tunable functional groups also makes them suitable for surface modification to decrease the surface tension. Different techniques are used to prepare the nanodiamond coating on various metal surfaces such as aluminum, stainless steel, and copper. The surfaces are modified with a long-chain fluorinated surfactant to decrease the surface energy. Thus, the super-hydrophobicity of these metals is achieved through the synergistic effect between nanostructure and low surface energy. The appropriate surface nanostructure was characterized by Scanning Electron Microscope, Infrared Spectroscopy Attenuated Total Reflection and Atomic Force Microscopy. Super-hydrophobicity of the modified coating is also characterized by the static contact angle of over 150°. Furthermore, testing on the durability of the coating and applications to different materials remains as the future objectives of this project.

## *Applications of Machine Learning in Content Generation for Educational Video-Games*

**Lloyd Donelan, Kishan Patel, and Brenton Lenzen**

*Faculty Advisor: Dr. Andre Thomas*

Over the past few years, students have become increasingly unmotivated to read their assigned textbooks as an accompaniment to classroom lectures and activities. Reading the textbook is known to improve comprehension and overall student performance in classrooms. If reading the textbook was reformatted into a more engaging experience, perhaps it would improve student motivation and knowledge retention. Teaching students the importance of learning while also motivating them to do well in class will help them gain the knowledge and grades needed to land competitive jobs after they graduate college. Game-Based Learning (GBL) is an emerging field of study that attempts to use video games to create interactive educational experiences. Game-Based Learning has been shown to have educational merit, being well-known for providing intrinsic motivation for students to learn (most often, as a supplement to traditional coursework). With GBL in mind, is it possible to generate interactive game content from textbooks using machine learning (ML) and artificial intelligence (AI) that can replace or supplement the source material in terms of educational content in a traditional classroom setting? Our team proposes to lay the groundwork for future research in Game-Based Learning and Machine

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Learning at the LIVE Lab undergraduate research lab (Texas A&M University, College of Architecture, Dept. of Visualization) by attempting to reformat school textbooks into interactive chatbot AIs with the assistance of knowledge compilation & fact-retrieval systems designed for generating educational video game content.

## *Exploring Medieval Attitudes toward Classical Antiquity through the Lens of Astronomy and Astrology*

**Katherine Hazel Miller**

*Faculty Advisor: Dr. Justin Lake*

This paper investigates the degree to which astrology remained unchanged in practice and theory between the pagan Greco-Roman classical period and the Middle Ages of Western Europe, which was greatly influenced by Christianity and the Catholic Church. In classical astrology, celestial bodies were beings on the level of gods, and it was their movement through the heavens that determined human fate (Edmonds, 237). Astrology and religion were inseparable; in fact, the planets maintained the attributes of the pagan gods whose names they shared (Lang, 3), suggesting that the planets were considered the gods themselves to some degree. In the Middle Ages, this pagan astrology was by definition incompatible with Christianity, which rejected the idea of gods other than the Christian God. Medieval practitioners sought to make the practice of astrology more acceptable to Christian leaders by reinterpreting the movement of celestial bodies as non-causal; that is, rather than writing the future, celestial bodies merely read a future that had already been written, which was more compatible with Christian teaching. However, despite both these efforts and the tendency of Christianity to assimilate pagan practices into Christian tradition, as seen through the Christmas and Easter holidays (Lauritsen, 287), astrology was never approved by the officials of the Church, who sought to rebut it (Laistner, 254).

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## Room: MSC 2502

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### *Sex Differences in Long-Term Recovery from Traumatic Brain Injury*

**Gianmarco Antonio Calderara**

*Faculty Advisor: Dr. Samba Reddy*

Traumatic brain injury (TBI) is a widespread neurological condition suffered by millions of individuals worldwide, including over 2.5 million cases of TBI per year in the U.S. alone. Most frequently induced as a consequence of contact sports, vehicular accidents, and military injuries, TBI can induce post-traumatic epilepsy (PTE), a condition characterized by recurrent, unprovoked seizures as a result of sustained head trauma. Despite the ubiquity of PTE, much of its underlying mechanism and pathophysiology remains unclear. Among other pre-injury factors, sex, which has been previously overlooked, may have significant impacts on patient outcomes. Further, with more women participating in sports and deploying in military operations than in previous decades, there is an increased demand for understanding the molecular and physiological basis for sex-related variations in recovery from TBI and PTE. In this study, we induced TBI in a female mouse cohort in order to explore the sex-dependent discrepancies associated with PTE. The subjects then received implantations of deep-hippocampal electrodes, allowing us to monitor brain activity through EEG analysis. Following the procedures, behavioral testing was performed at various timepoints over a 4-month period before the subjects were sacrificed and their brains removed. We then performed stereological examination of the dissected tissue, analyzing for principle neurons, inhibitory interneurons, injured neurons, and newborn neurons. This was done to determine the extent of neurodegeneration/neurogenesis inhibition exhibited by the animals. These results were then compared to a previously studied male cohort that underwent an identical protocol. The results suggest marked differences in functional recovery outcomes of TBI.

### *Characterizing the Role of Deptor in the mTOR Pathway in Cellular Protein Homeostasis*

**Christopher Anjorin**

*Faculty Advisor: Dr. James Fluckey*

Millions of people globally suffer from muscular dystrophies and atrophies either due to lack of exercise, genetics, malnutrition, illnesses, or conditions associated with muscular atrophy or dystrophy. Understanding the dynamic balance between protein synthesis and degradation is critical in characterizing skeletal muscle growth, maintenance, or wasting. Over 160,000 people in the United States suffer from Cachexia, a condition characterized by rapid muscle wasting often associated as a prognostic parameter for cancer. In addition, researchers from NASA reported in a study that astronauts lose an average of 20% or more skeletal muscle mass during space flights that last more than five days. Previous research has linked muscle cell growth with the mTOR {mammalian target of rapamycin} anabolic pathway; and has also shown that degradation or upregulation of DEPTOR {DEP-domain

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containing mTOR-interacting protein}, our protein of interest, has a direct impact on mTOR activation. Both mTOR and DEPTOR are vital for the overall health of the cell, but the interaction between these two proteins is often disrupted, favoring either muscle growth or muscle wasting. What is unclear is if this interaction is a consequence of underlying features of the cell, or a direct culprit. The hypothesis of the proposed study is that the rate of growth and degradation of skeletal muscle cells is a direct result of the DEPTOR/mTOR interaction. We will investigate growth and wasting of cultured skeletal muscle cells by altering the interaction between mTOR and DEPTOR via pharmacological intervention. This study will have implications on how we combat anabolically aggressive cancers, muscular dystrophy and atrophy, and mitigate muscular atrophy in astronauts during space mission.

### *Why Representation Matters: A Look into Asian American Voting Behavior*

**Kelsey Lauren Pormasdro**

*Faculty Advisor: Dr. Sarah Fulton*

Does the presence of an Asian congressional candidate increase voter turnout within Asians? Despite being one of the fastest growing demographics in the United States, Asian Americans are known to have low voter turnout that is disproportionate to their population size. Understanding why their turnout is so low is important in ensuring that the constituency accurately reflects the demographic of our nation. For my project, I take survey and observational data from the 2018 congressional elections to conduct a study that reflects the impact of descriptive representation on Asian voter turnout and overall political participation. While my research question has been posed as an area of inquiry in studies concerning the voter turnouts of other minorities, there are few studies that identify descriptive representation as a causal mechanism behind Asian voter turnout, especially at the congressional level. My intent is to bridge these gaps in literature and help contribute to the lack of studies on Asian American political participation.

**Room: MSC 2503**

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### *Regulation of Tumor Vascular Perfusion and Permeability by Endothelial NCK*

**Gladys Pedraza**

*Faculty Advisor: Dr. Gonzalo Rivera*

Tumor vasculature is characterized as being irregular, having low perfusion and increased permeability. These characteristics aid tumor growth and metastasis as well as decrease the effectiveness of targeted cancer therapies. The role of Nck adaptor proteins has been studied and has been identified as controlling actin cytoskeletal remodeling in response to signaling by tyrosine phosphorylation, which is important in developmental angiogenesis. Our goal is to determine how endothelial Nck regulates the tumor vasculature in angiogenesis. In order to do this, we used a syngeneic tumor model along with inducible, endothelial-specific knockout of Nck gene in mice. The following parameters will be compared

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in mice with vs. without endothelial Nck: i) tumor growth rates and tumor size at sacrifice; ii) tumor vascular development (angiogenesis); and iii) tumor vascular function (perfusion and permeability). We hypothesize that endothelial Nck promotes the development of a tumor vasculature characterized by decreased perfusion and increased permeability. Results from this research are expected to have an important positive impact on the subsequent development of new strategies to improve functionality in the tumor vasculature, and therefore, the efficacy of anticancer therapy.

### *Studying the Mechanism for vmlR Regulation by Observing the Effect of Chloramphenicol on the Expression of vmlR in B.subtilis.*

#### **Duha Eldow**

*Faculty Advisor: Dr. Paul Straight*

Antibiotic resistance emerged shortly after the introduction of antibiotics into the field of medicine. The application of antibiotics created a strong selective pressure that resulted in the emergence of bacteria that can survive this pressure. The genome of the surviving bacteria contains genes known as antibiotics resistant genes. Antibiotic resistance genes are highly regulated. They are expressed either when associated antibiotics are introduced or when certain conditions are reached, for example, a high population of bacteria. In a previous experiment, transcriptional analysis showed that the introduction of chloramphenicol to a B. subtilis population increases the expression of certain genes including bmrCD, mdr, vmlR, ytbD and yxjB. bmrCD and yxjB are regulated via ribo-regulation. In this type of regulation, a riboswitch or attenuator will form a terminator structure preventing ribosome from proceeding with translation, due to the coupling of transcription and translation. Certain antibiotics bind to the ribosome which causes the terminator to switch to anti-terminator allowing the ribosome to proceed with the translation. Attenuators and riboswitches are 5' untranslated RNA elements that are usually located near the promoter of the genes. This research tests if vmlR is regulated via ribo-regulation by observing the expression of luciferase reporter gene under the control of different lengths of vmlR promoter fragment with ribosomal and nonribosomal targeting antibiotics. The various promoters of vmlR are designed to either include or exclude predicted regulatory sequences. The results from these experiments will provide insights into the regulation of antibiotic-resistant genes in response to diverse antibiotic treatments.

### *Layer-by-Layer Polyphosphazene and Antimicrobial Coatings for Biomedical Applications*

#### **Jeremy Zheng**

*Faculty Advisor: Dr. Svetlana Sukhishvili*

Antimicrobial surfaces are highly desired to prevent bacterial colonization of surfaces. Such bacterial infections hinder patient recovery and cause medical device failure, so preventing bacterial colonization at the onset is of the utmost importance. The goal of this project is to develop antibiotic-containing self-defensive coatings that can prevent biofilm formation. This is achieved by utilizing polyphosphazenes

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(PPz), an inorganic and tunable polymer, to form coatings with antibiotics to inhibit biofilm formation. Polyphosphazenes (PPzs) are a class of flexible, inorganic-organic hybrid polymers that are attractive biomaterials due to the ease of tunability of properties such as glass transition temperature, wettability, and degradation rate. This work explores polymer coatings of carboxylated Polyphosphazene and sulfonated Polyphosphazene with antibiotics. The goal was to develop an understanding of the effect of charge density, binding strength, and functional groups on film properties, including growth, swelling, hydrophobicity, degradation, and biofilm prevention. All PPzs enabled electrostatic layer-by-layer deposition with a wide range of cationic molecules. Therefore, PPz was grown with various cationic antibiotics such as Polymyxin B and Colistin. The growth trend was determined via dry thicknesses of films during layer build-up and was measured with spectroscopic ellipsometry. As expected, films with sulfo-containing PPzs exhibited more linear growth than carboxy-containing PPzs. Wettability, a crucial characteristic when considering the biocompatibility of a biomaterial, was assessed via static contact angle measurements. Altogether, these findings can lead to creating self-defensive antibacterial coatings for a multitude of purposes.

## Room: MSC 2504

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### *How Universal is the Universal R-Process Pattern?*

**Jessica Myron**

*Faculty Advisor: Dr. Jennifer Marshall*

The rapid neutron-capture (*r*-)process, is responsible for the creation of about half the elements heavier than iron in the Universe. However, the nature and astrophysical site of the *r*-process is still strongly debated. A small fraction of metal-poor stars exhibit enhancements in *r*-process elements ( $[Eu/Fe] > 0.3$ ). For these a very robust (universal) abundance pattern has been detected for the elements from Ba to Hf, matching that of the Solar system *r*-process abundance pattern. This project uses spectral synthesis to determine the abundance of neutron-capture elements in a sample of metal-poor stars with only small or no europium enhancement ( $[Eu/Fe] < 0.3$ ), to determine if this universal *r*-process abundance pattern extends to this group of stars and further characterize the production of neutron-capture elements in the early Universe. Answering the question how universal is the universal *r*-process pattern?

### *Commissioning of the GEM-CSC Integrated Local Trigger for Run-3 of the CMS Experiment at the Large Hadron Collider*

**Cameron Wetzel**

*Faculty Advisor: Dr. Alexei Safonov*

The high luminosity upgrade to the Large Hadron Collider (LHC), means a significant increase in data, which the existing muon trigger system's bandwidth is inadequate to process. The solution for enabling

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the muon system to handle this increase in data is the installation of thin Gas Electron Multiplier (GEM) detectors in front of the existing Cathode Strip Chambers (CSC), where the magnetic field is strong allowing for best measurement of the transverse momentum ( $p_T$ ). By combining the data from the new GE1/1 system with the ME1/1, we can increase the  $p_T$  resolution of the Level one (L1) trigger, allowing us to filter out many soft muons which otherwise would have been incorrectly reconstructed by the ME1/1 system alone, thus reducing the load on the higher level triggering system to catch these poor quality muons. In order to successfully implement this combined triggering system in time for the scheduled run-3, there must be an efficient means of commission the combined trigger system. I will develop the software and hardware tools, along with the procedure for verifying proper operation of this combined triggering system. This will vastly speed up the process of commissioning the combined Integrated Local Trigger (ILT), which will reduce the time wasted during installation, optimizing the amount of useful data collected by the CMS experiment.

### *Characterizing Photovoltaic System Arc-Faults*

**Fatima Al-Janahi and Rahul Balamurugan**

Texas A&M University at Qatar

*Faculty Advisor: Dr. Robert Balog*

Arc faults are breakages in circuit wiring that dissipate high energy over time which can potentially lead to electrical fires. The methods to detect arc faults in AC systems are well researched and arc fault detectors are in some places mandatory for high risk potential AC systems. However, DC arc faults are not as well researched due to the lack of many high voltage DC systems previously. As the number of photovoltaic installations (which are DC) is increasing at a fast pace, the risk of arc faults in the often very long wiring, and consequently the fire hazard, is also rising. This project aims to develop a mechatronics testbed to produce electrical arcs consistently in order to study and analyze them using frequency analysis techniques in MATLAB. Machine Learning techniques will then be used to study the arc characteristics and develop a mechanism to reliably detect them. The Fourier analysis method for DC arcs will also be compared against Wavelet decomposition analysis (from existing research) to gauge its effectiveness. The electrical signatures captured over the period of testing will be available in a public free access online database to assist developers and researchers to contribute in developing effective DC arc fault detectors.



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# Oral Session 4: 2:15 PM-3:15 PM

Room: MSC 2501

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## *Beyond the Bus Boycott: The Impact of Rosa Parks on the Civil Rights Movement*

**Kayla Richard**

*Faculty Advisor: Dr. Felipe Hinojosa*

In what ways did Rosa Parks contribute to and impact the civil rights movement as a leader and activist? The Montgomery Bus Boycott was a monumental moment in the Civil Rights Movement and it solidified Rosa Parks' place as an important historical figure. However, it has become the only aspect of her activism that she is known for and associated with by the general public. It made Rosa Parks a symbol and figure and the narrative has separated her from her identity as an activist and leader in the movement. In reality, Rosa Parks made important contributions to the Civil Rights Movement in a variety of ways other than the bus boycott. These contributions are worth highlighting and celebrating. There is much more that can be learned from the life of Rosa Parks that is still relevant today.

## *DaydreaMeD: An Examination of Maladaptive Daydreaming*

**Kathryn Dorothy Pattison**

Aggie Creative Collective

*Faculty Advisor: Dr. Jason Harris*

Maladaptive Daydreaming (MD) is the participation in immersive and complex fantasies that impede on everyday life. Those with this condition will spend up to hours a day lost in daydreams that often contain recurring characters or plotlines. Although daydreaming is an activity performed almost universally, little recognition or attention has been given to MD. While daydreaming has been seen countless throughout film and literature, never has it been identified as maladaptive, nor has it showcased the daily social and psychological impact of having a daydreaming disorder. Online forums and communities reflect that there is a larger audience aware of MD's existence. In fact, many of the individuals in these forums comment with relief and excitement at finding a way to define their experiences. With my research and creative artifact, I seek to provide a better understanding of this condition and the social, mental, and physical effects it can have. My planned novel, entitled 'daydreaMeD,' follows the lives of three teenagers who experience intense MD. Throughout the work, we see how each teen uses daydreaming as both a coping mechanism and, eventually, a tool for their creativity. Although each experience with MD is different, through these storylines I hope to portray what daily life is like when one's mind is obsessed with daydreaming.

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## *Las historias son para ti: An Anthology of Roma, Texas*

**Amy Lee Guzman**

Aggie Creative Collective

*Faculty Advisor: Dr. Jason Harris*

The Rio Grande Valley has been in recent years the attention of media outlets, literature, and art. And while not all that is portrayed is accurate, the depictions of the Valley are created from stereotypes and its people are merely caricatures, such as in novels like Jeanine Cummins' *American Dirt*. This creative artifact challenges the assumptions on how border culture is known to shape the expression of individuals of the Valley within and away from its geographical constraints as well as simply highlighting the real stories within border communities. Roma, Texas is the quintessential bordertown and backdrop in which I hope to address these issues. *Las historias son para ti* will rely heavily on the individual points of view of fictional Roma residents to explore everyday life and collectively build a more holistic cultural view of life on the border. The reoccurring protagonist, Magdalena Castillo, will be seen at various stages of her life, in and outside of Roma, and the Valley at large, to give the audience a chance to see her actions dictated by the environment in which she was raised. These characters will span different age groups, genders, and sexualities to break the homogenous typecast of what Mexicans and Chicanos living on the border look and act like as well as what they believe. This creative thesis will explore culture by looking at its nuances, through a cultural rather than historical framework.

## **Room: MSC 2502**

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## *The Right to Be Forgotten: A Protection from Excessive Social Punishment*

**Jacob A. Espinoza-Stewart**

Glasscock Summer Scholar

*Faculty Advisor: Dr. Linda Radzik*

In 1995, the European Council passed Directive 95/46 on the Protection of Individuals with Regard to the Processing of Personal Data and on the Free Movement of Such Data. This directive claimed to "protect the fundamental rights and freedoms of natural persons, and in particular their right to privacy." The right to be forgotten was born out of this idea with the decision from the case *Google Spain SL, Google Inc v. Agencia Española de Protección de Datos, Mario Costeja González* (2014). In this case, the individual, Mario, wished to have himself removed from a newspaper article and Google search about a foreclosure that took place. While the first was denied, the second was not and the search result was removed from Google. Google fought to reverse this action, but failed. They then became responsible for removing search results upon request. They were to remove any information that was "inadequate, irrelevant or excessive in relation to the purposes of the processing" (*Google Spain SL v. Agencia Española De Protección De Datos*). Since that case over 650,000 requests for removal have been made. Google has stated that 89% of requests have come from private individuals since they

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began tracking more detailed information in 2016. Social media sites, directories, news articles, and government pages have made up a majority of the search results people want removed. My interest in this topic stems from wondering why so many people would want these search results to be removed and forgotten. I wish to put forth the ethical claim that people should have control over their ability to form and shape their own reputation and dignity. The right to be forgotten I will argue is a way of protecting this ethical claim from excessive social punishment that is coming from the internet.

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## *Evaluation of L1 Residence for Perceptron Filter Enhanced Signature Path Prefetcher*

**Alexander Staggs**

*Faculty Advisor: Dr. Paul Gratz*

Rapid advancement of integrated circuit technology described by Moore's Law has greatly increased computational power. Processors have taken advantage of this by increasing computation rates, while memory has gained increased capacity. As processor operation speeds have greatly exceeded memory access times, computer architects have developed methods of prefetching data from memory to hide the latency penalty usually incurred on a cache miss. Recent innovations to this field were submitted to the Data Prefetching Championship 3. Of these submissions, all but Texas A&M's submission of a Perceptron Prefetch Filter (PPF) Enhanced Signature Path Prefetcher (SPP) were primarily L1 resident. Movement of SPP to be L1 resident might allow greater performance by taking advantage of the increased information gained from a lower level cache's data stream. While an unoptimized movement of SPP from L2 residence to L1 showed performance degradation, optimizations such as using the L1 data stream to prefetch to all cache levels and deduplicating SPP's signature may show benefit.

## *Harvesting Low-Power Wireless Signals in the GHZ Range*

**Giuseppe Rizzi and Ethan Galloway**

*Faculty Advisor: Dr. Aydin Karsilayan*

We present methods for harvesting wireless energy as low as -30 dBm from the 2.4GHz frequency range (e.g. WiFi signals) with discrete components. A small input voltage of around 20mV AC will be boosted to a more usable voltage level of 1 V DC which can be used to charge batteries or run low-power devices. We are constructing a proof-of-concept device which will be capable of operating with no onboard power sources, relying solely on an ultra-low-power wireless energy source. The device will be constructed on a PCB and is subdivided into 3 parts: 1) an impedance matching network, 2) a rectifier, and 3) a series of DC-DC boost converter stages. The impedance matching network matches a 2.4 GHz 50 ohm signal input to the high impedance rectifier. The rectifier converts the AC signal from the impedance matching network to a DC signal. This DC signal feeds into the DC-DC converter stages which boosts the voltage from between 20-100mV DC to 1 V DC. The ALD110800 which is a special near zero-threshold transistor is being used to make this final DC-DC boost possible at such low input voltages.

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## Room: MSC 2503

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### *The King Conch Hotel*

**John Heselton**

Aggie Creative Collective

*Faculty Advisor: Dr. Lowell White*

The King Conch Hotel is the story of Marco, a teenage bellhop who works at the five-star King Conch Hotel on the island of Key West, Florida. Marco knows everything about the guests of the King Conch Hotel. He knows what they do on the island, where they go, when they plan to leave, even why they came to the island in the first place. Marco knows everything about the guests that stay at the King Conch Hotel, but what he can't figure out is why the manager, Mr. Cero, wants to know so much about the people who stay in his hotel? Set in 1980, *The King Conch Hotel* details the change of Key West from a shipping port to a vacation destination whose natural beaches and jungles have been replaced by resorts, shops and restaurants. From two teenage runaways that stay at the hotel to the famous millionaire owner of the hotel himself, each chapter details Marco's adventures following a different guest around the island, exploring themes of American material excess and the over commercialization of an island in the decade known as the "affluent eighties".

### *The Effect of Gender on the Influence of Religious Affiliation on the Roll Call Voting Behavior of Members of Congress*

**Anna Renee Houk**

*Faculty Advisor: Dr. Alex Pacek*

While independent effects of religious affiliation and gender on congressional voting behavior are well-documented, there is little research on how these two factors work together to affect congressional voting. In this paper, I seek to identify differences in how religious affiliation impacts the voting behavior of women and men in the U.S. House of Representatives. I posit that the effect of religious affiliation on legislative voting behavior will vary between women and men. I evaluate this claim by reviewing the roll-call voting records of members of Congress over the last forty years (97th Congress through 115th Congress) and examining how distinctions between the impact of religious affiliation on voting records of male and female legislators. In my evaluation of this data, I also discuss how the effect of religious affiliation on legislative behavior has evolved and potentially grown during this time period.

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## *Characterizing the Role of Transcription Factor Hb9 in Glial Cell Development*

**Sunjay Letchuman**

*Faculty Advisor: Dr. Jennifer Dulin*

Hb9 (Mnx1) is a transcription factor described as a motor neuron specific marker in embryonic development and a critical factor for the development of spinal cord motor neurons. We have found that within the postnatal and adult spinal cord, Hb9-expressing cells are distributed in an increasing gradient along the rostral-caudal axis. This distinctive localization of molecularly-defined cells has yet to be described in the literature, and in fact this phenomenon has only been described for a handful of genes. Furthermore, immunohistochemical analysis of both neonatal and adult mouse spinal cord tissue has shown Hb9 expression in astrocytes, a population of glial cells in the spinal cord. In the peripheral nervous system, we observed a similar phenomenon with Hb9-expressing Schwann cells present in an increasing rostral-caudal gradient throughout the body. These preliminary observations have several exciting implications. Hb9 may play an important role not only in astrocyte development, but also in development of Schwann cells, which are the glial cells associated with the peripheral nerves. Additionally, characterization of the differences between Hb9+ and Hb9- glial cells may reveal new functional roles for glia throughout the developing spinal cord. Through characterizing the role of Hb9 in glial cell development, describing the molecular pathways involved, and determining the differences in gene expression between Hb9+ and Hb9- spinal cord glial cells, the developmental function of Hb9 can be better understood.

## **Room: MSC 2504**

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## *Understanding and Evaluating Dynamic Race Prediction with Go*

**Andrew Chin**

*Faculty Advisor: Dr. Jeff Huang*

With the prevalence of parallel software and the difficulties that come with properly synchronizing concurrent software, it is easy to introduce data races into programs. A data race is a software bug which occurs when at least two threads simultaneously access shared memory, with at least one of them performing a write. Because of the indeterministic nature of thread scheduling, data races lead to undefined behavior which may only manifest in rare thread schedules. The difficulty lies in detecting hidden data races based on observed program executions. Go (Golang) is a modern, open source programming language designed for simplicity, efficiency, and reliability. With the introduction of Goroutines, Go enables quick development of highly concurrent software. However, this model makes it necessary to apply race detection to programs written in Go. We present an in-depth study of the Go Race Detector, a dynamic analysis tool developed by Google. The Go Race Detector traces program events and provides detailed information regarding detected races. Furthermore, we evaluate the race detector on Kubernetes, the most popular open source project written in Go.

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## *Childhood Food Insecurity*

**Marita Ann John**

LAUNCH Undergraduate Research Ambassador

*Faculty Advisor: Dr. Sarah Gatson*

The objective of this research is to introduce gardening to children facing food insecurity in order to mitigate the negative impacts of food insecurity in their households. Through previous studies, childhood food insecurity is seen to have drastic impacts in the health of growing children (Cook et. al). In addition to past research, gardening is a method utilized to teach children the importance of eating healthy and developing key qualities in them (Blair). From past research, it is yet to be fully understood how gardening can mitigate childhood food insecurity in communities in the Brazos Valley. Based on the fact of impacts of gardening, this research is anticipating that teaching children how to garden will give them the knowledge to grow their own sustainable gardens at home and help alleviate the impacts of food insecurity they face at home. Through this research, an outcome that can hopefully be achieved is the finding that teaching children how to garden will moderate the negative effects of being in a food-insecure household and overall attempt to break the endless cycle of food insecurity some children are born into.

## *Do Female Legislators Represent All Women and Marginalized Groups? A Study of 2 Latin American Legislatures*

**Jessica J. Garcia**

*Faculty Advisor: Dr. Michelle Taylor-Robinson*

This project explores whether large numbers of women in the legislature are associated with the representation of interests of diverse groups within the group "women." To begin to answer this question, I examine laws passed in Latin American legislatures specifically in Costa Rica (33.3% women, 2016), and Chiapas, Mexico (65% women). A novel aspect of my research is that I look at laws, rather than simply proposals that address needs of historically underrepresented groups, because I am interested in bills that actually get adopted. To create the dataset of laws examined in the paper I reviewed all laws passed in each legislature and selected laws that relate to women, indigenous people, or people in poverty. I look at who initiated the bill (as well as their party and background), how often these groups are mentioned in each law, and how they are addressed. Additionally, I intend to examine if any of these groups appear together within the same law.

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# Oral Session 5: 3:30 PM-4:30 PM

Room: MSC 2501

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## *What do you Meme: A Look at Historical and Literary Imitative Humor*

**Amy Katharine Harbourne**

*Faculty Advisor: Dr. Andrew Plisch*

This thesis is meant to expand the memetic discourse to non-contemporary periods and literature; beginning with Greeks during the Classical Period, followed by the culture surrounding Chaucer during the Late Middle Ages, and finally the Early Modern period of Shakespeare. My interest in this project began with the unearthing of a bathhouse in Pompeii from 78 B.C. I noticed that many of the translations taken from writing on the walls were not too different from something you would find today— both an antique classic piece of archaeology and the classic graffiti in bathrooms today. A sweeter excerpt from the walls is “If anyone does not believe in Venus, they should gaze at my girlfriend.” and on the other end, a more lewd piece of writing: “if anyone wants a screw, he should look for Attice; she costs 4 sestertii.”. Scholarly studies of contemporary imitative culture—books such as *Because Internet*, *Memes in Digital Culture*, and *Still Life With Rhetoric*—discuss the linguistic and rhetorical aspects of memes; however, they often lack a nuanced discussion of the historical aspect of meme culture. This thesis is determined to explore the linguistic and rhetorical nature of an analog to the image macro. Richard Dawkins is a canonical figure in Memetics; he gave it a name, however, his definition is increasingly inaccurate. This is what lead me to attempt to further nuance the convoluted discourse around memes. By studying the humorous nature that influences earlier forms of virality, I will be able to draw interesting parallels between contemporary and historical contexts for understanding memes. What I intend to investigate is where exactly can we identify those earlier forms of humor.

## *Attention Disparities of Cities on Social Media During Disasters*

**Miguel Esparza**

*Faculty Advisor: Dr. Ali Mostafavi*

During a natural hazard, communication is a crucial aspect of disaster planning, response, and recovery. Moreover, effective disaster communication can mitigate the impacts of a disaster, but ineffective disaster communication may exacerbate the impact of a disaster. Social media outlets, such as Twitter, offers the possibility of improved disaster communication because it has the potential for increased information capacity, dependability, interactivity. Additionally, social media can be used to indicate how damaged an area is through a content based analysis. This study performs a content based analysis by identifying the frequency of mentions a city has on social media in order to provide equal treatment during disaster recovery. Moreover, the communication needs of socially vulnerable groups, such as racial minorities and the poor have received minimal attention despite these groups suffering the most

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during a crisis. To address this knowledge gap, this research proposes the following questions: 1) To what extent does the frequency of mentions of cities in a content based analysis represent the damage a city receives.? 2) How uniform is the damage signaled on social media between socially vulnerable neighborhoods and non-socially vulnerable neighborhoods?

## *Leaving Wisdom*

**Zoe Allison Sherman**

Aggie Creative Collective

*Faculty Advisor: Dr. Lowell White*

Leaving Wisdom is a novella, based around historical and sociological research on New York City in the 1980's. The creative work follows seventeen-year-old Joanna Reese as she tries to make it on her own in New York City in the year 1984. This work explores themes of coming-of-age, mother-daughter relationships, and the unique cultural influence that the 1980's had on the youth during that time. In the past few years, a great deal of television and film have revisited the 1980's nostalgia, these works often overlook the true societal upheaval of the era and the way that it affected the psyche of the American teenager and Leaving Wisdom will attempt to create the most realistic recreation of the era as possible and utilize the setting to tell a moving narrative. Research for this project involves consultation of various primary historical resources such as newspapers and photographs to inform the setting of the novella. For character development and cultural reference I have completed a review of research done in the area of the psychology of teenage runaways, mother-daughter relationships, and the effects of environment on the development of adolescents. In addition to this research, various literary works published during the 1980's and about the 1980's are being utilized as reference for the novella as a form, stylistic approaches to prose, and artistic inspiration. The decade of the 1980's is enigmatic in its difficulty to be defined as an era and there are many contradicting opinions on how the decade should be remembered. Despite this, most will agree that the 1980's were incredibly influential years in the history of the United States, particularly for the youth of that era. The ripples of this influence can still be seen today popular media.



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## Room: MSC 2502

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### *Political Efficacy and the Russian Language: Language as Collective Subconscious and Related Trends*

**Sarah Stokes**

*Faculty Advisor: Dr. Olga Cooke*

This project examines the effect of passive language constructions on internal efficacy. Understanding how the Russian language frames ideas of responsibility and agency is vital to understanding current political culture in Russia and predicting possible outcomes for a Russia after Putin. Research has not yet connected the powerful influence linguistic constraints have on personal agency to political efficacy in Russia. Because passive participles and reflexive verbs denote a lack of agent or responsible actor, I expect to find a strong link between linguistic passivity and low internal efficacy. This project analyzes data from Национальный корпус русского языка (the National Corpus of the Russian Language) to assess passive constructions in Russian. It compares passive and active renderings of 5-8 semantically-identical phrases and compares the use of passive or active constructions across age groups in Russian society. At the same time, this project analyzes the distribution of political interest by age group in the Russian Federation by looking at national surveys. It observes whether the preference for passive voice is mirrored by a decrease in political interest. To assess political participation, it reviews voter turnout, party affiliation, and protest culture by age group and reviews whether the preference for passive voice is mirrored by a decrease in political participation.

### *Honey Bee (*Apis Mellifera*) Macronutrient Regulation: Nurse Bee Nutritional Preferences for Proteins and Lipids*

**Cora Garcia and Jordan Gomez**

*Faculty Advisor: Dr. Juliana Rangel*

Poor nutrition has been linked to declining honey bee populations, as it makes bees more susceptible to pathogens and lowers their survival and productivity. Given the growing prevalence of changing landscapes, resource availability has presented challenges to honey bees trying to acquire the resources necessary for adequate nutrition. Thus, commercial pollen substitutes are available for beekeepers to support colony health. Although the importance of nutrition in colony health is emphasized, research regarding specific macronutrient requirements of honey bees is limited. The necessity of protein to honey bee diets is well known, as it is required for rearing brood. Nurse bees consume protein-rich bee bread, a combination of pollen and nectar or honey to develop their glands for brood rearing. However, lipids are often overlooked in the bee diet. By creating a range of artificial diets that differed in macronutrient ratios of protein (P) and lipid (L), our research objective sought to determine a target macronutrient intake for nurse bees. Through a series of choice and no-choice assays, daily consumption was measured. In the no-choice test honey bees consumed the most of the 30:20 (%P:%L) diet. For the choice test, honey bees regulated their diet intake to an average of 1.4 P:L. Thus, the significant

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differences in this observed ratio to the macronutrient composition of pollen substitutes suggests the value of lipids may be underestimated in honey bee nutrition.

## *Sociological Case Study of Criminal Interrogation Techniques*

**Donald Ray DuPont**

*Faculty Advisor: Dr. Stjepan Mestrovic*

This research explores how investigative techniques of interrogation destroy a subject's sense of self and guide them to make inculpatory statements or confessions to be used in a Court of Law. The main theory to be used in this work is the theory of the self by William James. This theory is found in his 1890 book *The Principles of Psychology*. He divides the self into two classes. First are the concepts of the material self, social self, and spiritual self. The second category is the underlying structure which he calls the Pure Ego. When the parts of one's self are attacked, one's ability to synthesize these components into a coherent sense of identity becomes problematic and makes one vulnerable. When one develops abnormalities caused by either exterior or interior forces, "mutations of the self" may occur. The two classes for these mutations are 1) alterations of memory and 2) alterations in the present bodily and spiritual selves. This study is a qualitative approach aimed at analyzing actions and reactions in interrogation in the context of the theories of the self. In the study, I will be reviewing interrogation manuals employed by law enforcement and military special investigators. The study will document how one's sense of self is gradually manipulated through each step. As a supplement, various examples from footage of military criminal interrogations that became exhibits in Courts Martial cases will be used to document how interrogation practices are implemented. Lastly, excerpts from official records of trial in which both the special investigators and the accused spoke about what actions occurred in the interrogation room and their effect or purpose.

**Room: MSC 2503**

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## *The Effect of Grinding Lignocellulosic Biomass as a Mixed-Acid Fermentation Co-Treatment*

**Drew Jamal Samuelson Marks**

*Faculty Advisor: Dr. Mark Holtzapple*

In order to prevent the detrimental effects of climate change in the near future, novel energy solutions must be explored and developed today. Lignocellulose (LC), a major component in wood-like plant matter, is a primary candidate for the production of biofuels as a carbon-neutral energy alternative due to its abundance and renewable nature. Although lignocellulose is cheap and readily available, the process of converting LC into valuable products (e.g., fuels, chemicals) can be uneconomical due to the recalcitrance of LC. Traditionally, in order to improve the economic viability of LC fermentation, LC

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biomass is chemically pretreated to disrupt its rigid cell structure and achieve greater yields, however, this pretreatment remains expensive and can result in wasted lignin and hemicellulose in the LC biomass. In contrast to an expensive and wasteful chemical pretreatment of LC biomass, a mechanical co-treatment approach to mixed-acid fermentation can be key to making the fermentation process economical by achieving similar yields at a reduced cost. In this thesis, the effects of grinding LC biomass over the course of a mixed-acid fermentation process are explored.

## *The US Trade War with China and its Economical Impact*

**Yuhan Zhang and Xuezhou Chong**

*Faculty Advisor: Dr. Qi Li*

As the two largest national economies, China and US economic relations have expanded substantially over the past decades. China is the US's second-largest merchandise trading partner, third-largest export market, and the biggest source of imports. During Trump's presidency, he advocated tariffs to reduce the deficit of the US and promote domestic manufacturing, he argued that the United States was being "ripped off" by the trading partners and adding a tariff on the importing countries may develop domestic manufacturing and reduce the deficit. So when he met with the Editorial Board of the New York Times in 2016, he proposed the idea of imposing 45 percent import tariffs on China's exports to the United States. Our main objective is to measure the economic impact that the trade war has on the two countries. In order to measure the economic effect of a country, the best monetary measurement would be Gross Domestic Products. Since the data for GDP is yearly-basis, and Net Export also has a positive relationship with GDP, the estimation concludes that a 1% increase in per capita trade raises the equilibrium GDP growth rate by 0.29%. So, in order to be more precise, we use the Net Export of China to measure the economic impact of the trade war. From the result, we can draw some further thoughts. For example, will China have a much negative effect due to the trade war with the US? Also, since we use daily data and Hsiao, Ching and Wan's method, we believe that our model will accurately measure the effect of the trade war.

## *Intersex: The Conversation between Biological Design and Social Response*

**Sarah Aboud**

*Faculty Advisor: Dr. Sara DiCaglio*

My study will explore the cultural and biological implications of gender by examining the rhetorical construction of intersex conditions, focusing primarily on the experiences of female athletes. Women aspiring to succeed in a career of physical performance are subject to scrutiny from audiences inhibited by biological and social biases, developed as a product of culturally established prejudices against female's physical capacity and misleading medical sciences firmly established within the parameters of female or male sexes. It is important to address the impact of binary sex on biological reasoning, gender expectations that dictate the social sphere, and the rhetorical influences between both fields. In approaching these topics with a perspective and lexicon beyond binary sex, we can develop a better understanding of gender, human biology, and female capability as professional athletes. I intend to

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expand on the research already accumulated on the topic of hormones, the history of sex-verification testing distributed to female athletes, and the specific case-study of women like Caster Semenya, a long-distance runner with hypoandrogenism, and others like her by providing a perspective in medical rhetoric. By the conclusion of my study, I will challenge the social and biological expectation of female athletes and intersex using thorough rhetorical analysis to understand the factors of language that craft the development of public opinion and ultimately argue to improve the conditions and expectations of female athletes by promoting awareness to the persuasion of language.

## Room: MSC 2504

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### *Towards a Conception of Gendersex*

**Jake Donohue**

*Faculty Advisor: Dr. Daniel Humphrey*

The problem of the sex/gender distinction has been a pertinent theoretical concern within feminist theory for decades. Some theorists confirm this division and conceptualize sex and gender as exclusive and divided categories of which different positions operate under differing dynamics. For gender, its constitutive positions, man, woman, and the genderqueer respectively, are framed as cultural products or psychological phenomena; while for sex, its constitutive positions, male, female, intersex, take various biological localities, such as anatomy or genes. On the other hand, other theorists have articulated how the division collapses when put under scrutiny. What must be noted, however, is that in the affirmation of this collapse the typical theoretical course of action is to grant an ultimate primacy of one category over the other. In one form, this granting may be through positing sex as constitutive of gender. Inversely, this granting may be through positing gender as constitutive of sex. Thus, these frameworks unavoidably maintain the sex/gender distinction despite attempting to undo it. Rather than grant primacy to either the realm of sex or the realm of gender, I put forth the neologistic conception of 'gendersex' to serve a function of collapsing the distinction. Gendersex treats all occupiable positions of sex and gender as belonging to same comprehensive realm, and does not bar these positions from occupying a variety of loci that themselves may or may not be contradictory. Thusly, gendersex allows for a theoretically framing these positions that avoids becoming entrenched in the contradictory diversionary realms of sex or gender.

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## *Volatile Organic Compound Emissions from Flower Buds and Fruits of Cotton Plants Treated with Beneficial Fungi*

**Caroline Wilson**

*Faculty Advisor: Dr. Greg Sword*

The purpose of this research is to analyze volatile organic compounds (VOCs) of developing flower buds (squares) and immature fruits (bolls) of cotton plants (*Gossypium hirsutum L.*) when treated with plant associated fungi. These compounds will be analyzed by gas chromatography to mass spectrometry (GC-MS). Experiments will be conducted using excised squares and bolls from both greenhouse and field plants. The results will be evaluated to indicate if plant associated fungi are effective in encouraging the plants to produce chemicals that could potentially deter insects from consuming the plant. VOCs are known to influence herbivorous insects' ability to locate plants (Dudareva et al. 2006, Holopainen 2004). Beneficial fungi were found to affect herbivorous insects' behavior, potentially from the influence of VOC emissions (Sword et al 2017). This research will assess whether seed treatments with fungal spores will affect flowering buds and bolls of cotton plants VOC profile. It can be expected that there will be a difference in volatile emissions, but the positive or negative effects may not be as clear.

## *The Philosophical and Legal Implications of Granting Ecosystems Legal Personhood*

**Eric Nash**

Glasscock Summer Scholar

*Faculty Advisor: Dr. Linda Radzik*

In the 21st century, an unprecedented problem looms across the breadth of every nation in the world. The only danger that can cast such a wide net is one that has stood center stage in many contemporary political and academic debates: environmental degradation. The earth, to human beings, has been something to claim, something to extract resources from. However, this purely economic approach to environmental conservation has caused the best interests of nature to take a back seat to human gratification. The consequences of such behavior have recently made themselves known, and while some refuse to acknowledge the crisis at hand, others are grasping for a way to solve this problem. Some legal systems (such as India, New Zealand, and Ohio) have flirted with an approach that has failed to be seriously considered by many other countries. This approach grants natural objects (forests, rivers, lakes, etc...) legal personhood. This method transforms what was previously property into its own legal entity, meaning that these pieces of the environment now have the "rights, powers, duties and liabilities of a legal person" (Hutchinson 2014). I plan on reviewing the philosophical undertones of treating the environment as a legal person while examining the larger legal ramifications that it will have on our current system if put into effect. Moreover, if the in-practice version of such a bold legal move proves to be incorrigible, I will be suggesting ways to modify the system in order to yield a strategy that is more plausible and efficacious. Hopefully, by considering the manipulating of the law with this new conservation technique we will discover a truly useful way to protecting the environment.

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# Poster Session 1: 10:00 AM-11:00 AM

Room: MSC 2300 A-B

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## Posters 1-10

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*Poster 1*

### *Ostracism, Belongingness, and Alcohol Use: Comparing Different Racial/Ethnic Groups*

**Pranali Haribhakti**

*Faculty Advisor: Dr. Sherecce Fields*

Previous research in the field of substance use has revealed that simulating ostracism in a laboratory setting leads to increased alcohol use (Bacon & Engerman, 2018). Ostracism is considered a stressful event that produces negative affect, and is found to increase the likelihood of drinking in the short-term (Armeli, Conner, Cullum, & Tennen, 2010). Furthermore, it has also been shown that the chronic uncertainty about belonging undermines minority individuals' performance (Walton & Cohen, 2007), in turn causing significantly stressful events. Hence, the current study, administered as a questionnaire, aims to look at the levels of ostracism, social isolation, and social belongingness experienced by the first-year racially diverse students at Texas A&M University, and its relationship to their alcohol use patterns. The role of social support and social connectedness will also be considered to see if those factors have a protective effect in risky alcohol use patterns. Data collection and analysis pending, we hope to find a difference in the alcohol use patterns between different racial groups.

*Poster 2*

### *Design of a Prediction Game in the Domain of Computer Security*

**Siddharth Sundar**

*Faculty Advisor: Dr. Frank Shipman*

Prediction Games are games where players analyze historical data and make predictions about future events. The predictions are scored which gives the players an idea of where they stand. This game is appropriate for domains where data is coming in frequently and where there is a decent quantity of historical data for participants to explore. Knowledge in Computer Security carries high value personally and professionally and statistics in this data domain is collected by many organizations for various reasons. This thesis explores the design of a prediction game in the field of Computer Security. The goals of this project include identifying data sets that could be used for a prediction game, designing a

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prediction activity which will be helpful to players, and developing a prototype version of the prediction game. A heuristic evaluation of the prototype will provide feedback for improvements to the game mechanics such as user interface and data visualizations. At the end of the project, there will be a greater understanding of the availability of computer security data, how it can be used for developing prediction games, and tradeoffs in the design of computer security prediction games.

Poster 3

### *The Toxicity of Weathered Oil on an Oil Resistant Diatom Species*

**Alexandra Yard**

Texas A&M University at Galveston

*Faculty Advisor: Dr. Peter Santschi*

This project will investigate the toxicity of weathered oil on an oil resistant diatom species, *Phaeodactylum tricornutum*. Most oil toxicology studies focus on the use of fresh oil, while marine organisms that live in the euphotic zone are exposed to photo-oxidized oil. The main research questions focus on the toxicity of weathered oil in comparison to fresh oil and how *P. tricornutum* responds to this form of pollution. These and related questions are of utmost importance when discussing the lasting effects of an oil spill event on primary producers; they will be explored through batch-culture experiments. Diatom cultures including an oil resistant species, *P. tricornutum*, will be exposed to fresh and weathered oil in the form of a water accommodated fraction of oil (WAF). Based on the literature review, it is hypothesized that weathered oil will be more toxic than fresh oil. In particular, it is expected that weathered oil will have a negative physiological effect on *P. tricornutum* and this species will recover after the oil is removed from the water column.

Poster 4

### *Motion Planning for Tethered Robots*

**Madeleine Phillips**

*Faculty Advisor: Dr. Dylan Shell*

Motion Planning algorithms have been studied in many applications, such as circuit design, network design, and robot motions. However, in the field of Robotics, in some settings the motion might be limited by a cable, preventing the robot from fully realizing its capabilities. Existence of a cable poses new restrictions on the robot's motion. For instance, the robot has to avoid entangling the cable with obstacles or damaging the cable, while still trying to accomplish its goal. This research aims to provide hardware implementation for an algorithm introduced by Reza Teshnizi and Dylan Shell that plans motions for a robot in such settings. The original publication has only demonstrated the algorithm in a simplistic simulation environment. An extension to this algorithm can be utilized to plan motions for a pair of robots that are connected to one another via cable of fixed length. By connecting these two robots, this imposes a new restriction on where the robots could travel because the robots have to travel together without entangling the tether. This research for the algorithm for two robots is in

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progress at the moment. The outcome of this project should verify the simulated results in the publication written by Shell and Teshnizi.

*Poster 5*

### ***Analyzing Multi-Phase Flow in 3D Printed Micro-Models***

**Jerahmeel Corbane Bautista**

Texas A&M University at Qatar

*Faculty Advisor: Dr. Nayef Alyafei*

In a world where energy demands are increasing and resources are depleting, gaining better insights into fluid saturation distributions and transport mechanisms within hydrocarbon reservoirs at the pore scale will be critical to maximizing future production of oil and gas globally. This research project is based on understanding multi-phase flow in porous media, which will be done through analyzing the flow in transparent micro-models fabricated using 3D printing tools. These micro-models will facilitate the direct visualization of drainage and imbibition within porous media through the use of image visualization techniques which include the use of thin-section micrographs, micro CT orthoslices, and conventional digital photographs. An open-source toolkit, written in MATLAB language, will be used to generate the micro-models, and through this research, we hope to demonstrate the toolkit's capabilities. Orthoslices of scanned rocks (Berea sandstone) will be cropped and segmented and then used to generate watertight 3D meshes of micro-models which will then be 3D printed. The availability of such a toolset will act as a major enabler for community research in porous media transport phenomena, allowing experimental pore networks to be generated rapidly and cost-effectively using readily available additive manufacturing technologies.

*Poster 6*

### ***Synthesis of Monometallic Hydrogenase Mimics for Use in the Hydrogen Evolution Reaction***

**Madlyn Crist**

Texas A&M University at Galveston, Texas Sea Grant Scholar

*Faculty Advisor: Dr. Olbelina Ulloa*

The conducted research explored the synthesis of monometallic complexes containing earth-abundant metals, similar to those found in marine bacterium, for the purpose of catalyzing the hydrogen evolution reaction (HER). After successful synthesis, these hydrogenase mimics were tested via electrochemical analysis to determine turnover rates and numbers of hydrogen. Hydrogenase enzymes are found in microorganisms, such as the marine bacterium *Alteromonas macleodii*, and use earth-abundant metals, like nickel and iron, to catalyze the HER at high rates and turnovers. If the results of this research show comparative turnover rates and numbers to the more expensive state-of-the-art catalysts, like platinum or metallic sheets, these complexes could be good candidates for large-scale production and



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commercialization, due to the use of less-expensive earth-abundant metals. The successful commercialization of the proposed hydrogenase mimics can help establish hydrogen gas as a household alternative to fossil fuels. In order to create these hydrogenase mimics, known p-diaminedithiolate ligands and metallic reagents were synthesized based on literature procedures and combined to make the desired monometallic complexes, or hydrogenase mimics. By utilizing different metal salts — nickel, cobalt, and iron — the synthesis of a family of hydrogenases was possible. Characterization of the hydrogenase mimics was conducted via HNMR, IR, and mass spectroscopy. The efficiency of the hydrogenase models will be quantified using electrochemical analysis of their use HERs. Expected results of electrochemical analysis include high turnover rates and numbers of hydrogen, as well as an ease of synthesis of these models.

*Poster 7*

### ***Rifts in Knowledge: The Impacts of Tourists with Hand-Held Lights on Sea Turtle Nesting Beaches***

**Margaret Guy**

Texas Sea Grant Scholar

*Faculty Advisor: Dr. Lee Fitzgerald*

The marine life of the ocean is in decline. Sea turtles represent an iconic group of organisms decimated by the human ecological footprint. Documented anthropogenic threats such as light pollution remain a pervasive threat to sea turtles populations. Light pollution is obtrusive artificial light originating from infrastructure and other forms of human development that can alter critical animal behavior. Research has uncovered the implications of artificial light for both nesting and hatchling sea turtles. Light pollution can disrupt female egg-laying and may result in lower nest density. Artificial light at night can also disorient hatchlings upon emergence from the nest as they attempt to orient towards the sea. Policies enacted to protect turtles often restrict hand-held light use on beaches due to claims that tourists with flashlights can disturb nesting females and disrupt hatchling sea-finding. However, a review of all the science and literature found limited research that examines the significance of tourists with hand-held lights for hatchling or nesting sea turtles, suggesting a gap in knowledge concerning this topic and an area in need of future study.

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Poster 8

### *Implementing Transfer Learning for Mitotic Cell Detection*

**Muhammed Zahid Kamil**

Texas A&M University at Qatar

*Faculty Advisor: Dr. Jim Ji*

The primary objective of this project is to use a neural network (deep learning) model that will be trained on datasets of human cells in mitosis and then apply it on animal cells using transfer learning techniques. The purpose of this project is to speed up the process for the pathologist to detect mitotic activity for cancer diagnosis and determine transfer learning techniques that will aid in predicting mitotic activity in animal cells. This information will prove to be useful for correct diagnosis of cancer and reduce potential errors of detecting mitotic cells. Instead of acquiring the highly meticulous task of the labelled data, transfer learning can produce promising results by reusing the learned features from human datasets and applying the learned knowledge to the datasets of the animal cells. This project proposes to develop a higher detection accuracy with our framework of transfer learning and optimize the deep learning model to produce the desired output of detecting mitotic cells in animals with the limited amount of training data. Transfer learning techniques will be aimed to improve the performance of learning in other domains and reduce the cost of the expensive labeled data. Further, the project will also include the process of determining the minimum amount of data required for this transfer learning that may prove to be useful for future transfer learning applications.

Poster 9

### *Measurement of Particle Charge and Adhesion Force between the Particle and a Transparent Surface Using Electrostatic Detachment Method*

**Maryam Rashid S F Al-Buainain and Hassan Ejaz Haider**

Texas A&M University at Qatar

*Faculty Advisor: Dr. Bing Guo*

Attachment of particles to certain surfaces like glass plays a critical role in engineering and natural process. An application can be found in the solar energy field as the accumulation of dust particles on the solar photovoltaic (PV) panel surface can reduce the efficiency of the solar panel with time. The primary objective of this research is to measure electrostatic charge and adhesion force of glass particles with a surface. The independent variables in this investigation will include particle diameter and humidity. The output variables are charge of the particle and its adhesion force with the surface. The apparatus needed consists of a microscope, high-speed camera, high voltage amplifier, function generator, and two conductive glass plates within a 3D printed humidity chamber. The silica particles will be placed on the bottom plate where they will be subjected to a uniform electric field across the two plates upon which the particles will travel from the bottom to the top plate. The humidity chamber has been fabricated, and the apparatus was tested by applying the electric field across the glass plates.

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Expected results will include graphs of adhesion force and electrical charge of the particle as a function of particle size and humidity.

*Poster 10*

### *A Design Analytics Dashboard to Support Students and Instructors*

**Gabriel Britain**

*Faculty Advisor: Dr. Andruid Kerne*

As technology becomes increasingly integrated into design education, new opportunities arise for deriving insights from design products and processes, and presenting those insights on-demand to instructors and students. Prior work in this space derives only a limited set of analytics, and does not evaluate their usefulness in the context of design courses. I develop a set of design analytics dashboards that visualize different characteristics of students' design work, deriving analytics based on Kerne et al's quantitative metrics for evaluating open-ended tasks and activities. My research constructs a system for students to submit their assignments to their instructor, and computes the aforementioned analytics for each of the students' submissions. These analytics are then provided to both students and instructors, enabling feedback on specific submissions as well as understanding changes over time. I explore how the on-demand presentation of these analytics to instructors and students can transform creative design teaching and learning processes. As students and instructors use the systems over a semester, I conduct and analyze semi-structured interviews, building and revising my understanding based on the insights from instructors and students. In addition to the qualitative data gathered from the user interviews, I collect quantitative data from user interaction logs and derive usage metrics to gain insights into how students and instructors used these systems. This research has the potential to contribute to our understanding of how to present interactive on-demand feedback to students about their design work, and overviews of student performance to instructors.

## **Posters 11-20**

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*Poster 11*

### *UI/UX Methodologies for Light-Field Display*

**Monica Lam He**

*Faculty Advisor: Dr. Anatol Bologan*

Currently medical students studying anatomy have to rely on 2D books or 3D mannequins and cadavers to learn about the human body. Taking the human body into the second-dimension limits one with the simplicity of a plastic mannequin and the sensitive complexity of a human cadaver. An easier solution to anatomical education is displaying the material through 3D holograms. Holography allows the user to see fully parallaxed three-dimensional images without needing supplementary vision-aids. Being able to resolve depth in a scene improves one's spatial understanding of the environment and material. With

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this in mind, we are developing a UX/UI companion display that can be incorporated with the existing FoVI3D light-field display table. This control and informational interface will allow users to use and more easily understand the functions of the light-field display table. FoVI3D allows its users to collaborate in the same environment, from multiple angles, within the light-field display view volume. This technology also creates an immersive environment by allowing its users to interact with a three-dimensional aerial image that is visible to the eye without the use of any glasses or head tracking. This continuing innovation in display technology allows 3D projected images to be more easily accessible to a variety of research fields such as medicine, architecture and engineering.

*Poster 12*

***A New Way to Cope: Social Media as a Form of Coping with Racial Discrimination***

**Lincoln-Abdullah Hasan El-Amin**

Glasscock Summer Scholar

*Faculty Advisor: Dr. Adrienne Carter-Sowell*

This study aims to answer the question, 'does social media usage influence the effects of racial discrimination on mental health.' Specifically, this study examines the impact that social media usage has on the relationship between self-reported racial discrimination and psychological distress. Supporting results from this study would provide African Americans another way to deal with racial abuse. Experiences of discrimination were assessed using the Williams Everyday Scale, a 10-question scale of self-reported discrimination encounters. Psychological distress is assessed using the Kessler 6 Scale, a six-question scale of psychological wellbeing. For the purposes of this study, social media usage is defined by those who have a Facebook account, a Twitter account, and their frequency of usage. Data analysis was based on a sample of 220 African American adult respondents residing in Texas. Results indicate that African Americans reporting higher levels of racial discrimination are more likely to meet the criteria for psychological distress than those who report lower levels of discrimination. However, social media usage buffer this relationship and results in lower levels of psychological distress among those reporting high levels of racial discrimination. Together, these finding suggests that social media can be a form of coping to mitigate the effects of racial discrimination on mental health.

*Poster 13*

***Subject-Matter Experts: Leveraging Attention-Based Modeling to Determine Experts in Amazon Reviews***

**Jonathan Innis**

*Faculty Advisor: Dr. James Caverlee*

When browsing the internet to purchase products, consumers often use reviews as a primary source for information to differentiate between various products that may be available online. Because of the crowd-sourcing nature of reviews, it is possible that a product can receive a low review rating simply

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because the majority of consumers misuse or do not know how to use it. Our work attempts to use NLP (natural language processing) modeling to differentiate between consumers who understand a particular product (experts) and consumers who do not understand a particular product (non-experts). We then aggregate this new review-set producing an "expert rating" for a product. By producing expert review ratings and filtering out non-expert reviews from the user, we believe that our work will provide consumers with a more consumable and accurate review set. We propose a 3-part study involving data sampling experimentation, review structure experimentation, and model experimentation. While we approached this work with traditional machine-learning models, we extend our research to leverage deep neural nets, convolutional neural nets, long-short term memory models, and attention-based models. Through our work, we find that there is good potential to link crowd reviews to expert reviews and that there is evidence to suggest that this link may be generalizable outside of the tested domains.

*Poster 14*

### ***An Unusual Metal Templating Effect Switching an $N_2S_2$ Ligand to a Binucleating, Tridentate $S_2O_2$ Ligand***

**Hao Anh Nguyen**

*Faculty Advisor: Dr. Marcetta Darensbourg*

Natural metalloenzymes are models for chemists to design organometallic catalysts. Interestingly, the selections of metal and the responses to the metal substitution of these enzymes are usually surprising due to the unpredictability and variety. A tripeptide Cys-Gly-Cys biomimetic  $N_2S_2$  ligand class, which is found in acetyl-CoA-synthase active site, has caught attention due to its capability of encapsulating a metal cation giving rise to a variety of  $MN_2S_2$  units. It has been shown that these units can trap extraneous metal ions using the additional lone pairs of the thiolate sulfurs while keeping the  $MN_2S_2$  unit intact. Here, when choosing M-ema as the  $MN_2S_2$  ligand to react with  $Mn(CO)_5Br$  (ema = N,N'-ethylenebis(2-mercaptoacetamide)), an unprecedented result was obtained, in which M is removed from the tetradentate tight binding site and ema becomes a tridentate binucleating  $S_2O_2$  ligand to a two-manganese bimetallic system. Characterizations of this novel compound -  $[Mn(CO)_3]_2(ema)$  - were achieved by using NMR, infrared spectroscopy, X-Ray diffraction, and mass spectrometry. Different synthetic approaches to  $[Mn(CO)_3]_2(ema)$  with modified starting materials reveal a metal-templated process where folding the backbone of ema ligand is essential to target the final product. With this method, the Re analogue of  $[Mn(CO)_3]_2(H_2ema)$  was also synthesized and the Fe analogue has been in its preparation progress. The solid-state structures of these compounds show a pseudo-octahedral geometry around each metal center which has two bridging thiolate sulfurs, three carbonyls, and one carboxamide oxygen. In addition, two five-membered M-S-CH<sub>2</sub>-C-O rings in which the metal centers reside both hard and soft ligand donor sites suggest exciting reactivities and applications.

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Poster 15

## ***Embryonic Lethality in Mice Expressing Conditionally-Stabilized Ctnnb1 Under Control of Vil-Cre***

**Mayur Bansal**

*Faculty Advisor: Dr. David Threadgill*

Beta-catenin (CTNNB1) is a key downstream effector of the WNT signaling pathway, a pathway involved in embryonic development and tumorigenesis. To further study the role of CTNNB1 in gut tumorigenesis, mice homozygous for a conditional stabilizing mutation of Ctnnb1 (a floxed allele) were crossed with mice hemizygous for a Cre recombinase under a gut-specific promoter (Villin-Cre). However, contrary to expectations of Mendelian inheritance, no double heterozygous mice (Ctnnb1<sup>flox</sup>, Villin-Cre) were observed at birth, suggesting embryonic lethality. Since the WNT signaling pathway is involved in embryonic development, and previous studies have confirmed the expression of Villin in the visceral yolk, this study primarily focused on potential placental defects that may have caused the lethality. After we determined that embryonic lethality occurs between embryonic stage 11.5 and 13.5 by counting surviving embryos at these stages, a Rosa26 reporter was crossed with Villin-Cre and the resulting embryos and placentae were analyzed for the location of LacZ staining. We found that Villin-Cre is expressing in the yolk sac epithelium, indicating potential defects in cellular function or the hematopoietic pathway caused by the Ctnnb1 mutation. We are currently assessing gene expression in yolk sac epitheliums by RNAseq to provide insights into the molecular changes caused by ectopic WNT signaling due to stabilization of CTNNB1.

Poster 16

## ***Recognition of the Upper Limb's Motion Intention Using Electroencephalogram and Machine-Learning Techniques***

**Leen Taha Al Hamoud, Dana AlYafei, and Fatima Al-Khuzaei**

Texas A&M University at Qatar

*Faculty Advisor: Dr. Reza Tafreshi*

The electroencephalogram (EEG) signals are a measurable electrical activity of the brain. EEG signals are generated 200-600 ms before the actual voluntary action, for example, as moving a limb to walk or drink water. The study aims to help people with minimal arm movement, muscular dystrophy in a less invasive method. In this research, the EEG signals will be used to distinguish between three motions: moving an arm forward, grabbing an object, and moving an arm upwards. Ten healthy subjects within the age range of 18-65 years-old will be asked to repeat the three tasks for 20 trials each. The data will be collected using ENOBIO 8 at sampling frequency 500 Hz, a bandpass filter of range 0.5-100 will be used to pre-process the data. Noise due to sensor and artefacts such as eye blinking can cause inaccuracies in the machine-learning performance. Artefacts and noise will be minimised using EEGLAB. The basic time domain features extracted from the data includes the mean absolute value, zero crossing, and waveform length. The machine learning algorithm, k-Nearest Neighbour (kNN), will be developed to

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classify the three motions. The optimum window size and number of neighbours in the algorithm will be found. In addition, it will be determined whether window overlapping could be used in processing the signals. The algorithm will be evaluated using statistical analysis and compared to other machine learning techniques from previous research. The classified signals can be used for further biomedical research and be utilized to expand the growing biomedical research field in Qatar that relates to Brain-Computer Interface (BCI) technology.

*Poster 17*

### ***Analysis of Plasmonic Enhanced Thin-Film Solar Cells as Rooftop Photovoltaic Systems***

**Neeki Mostoufi**

*Faculty Advisor: Dr. Shima Hajimirza*

The emergence and development of photovoltaic (PV) technology has grabbed the attention of many energy users and policy makers as the next leading energy producer. With environmental conditions predicted to reach dangerous and almost inhabitable levels, companies and governments have looked to PV as a promising solution to the energy crisis. Significant progress has been made in PV research through innovations of device architecture, material design, and improvement of device performance is increasingly evident. The purpose of this thesis is to explore the real-life application of plasmonic enhanced thin-film solar cells through a theoretical case study of Texas A&M's campus. Buildings will be selected based on specific selection criteria relevant to rooftop PV application. Optical and electrical performance will be carried out using computational modeling that implements finite difference time domain method and drift diffusion equations, respectively. Electricity generation will be compared to determine which application produced the best results and whether it is feasible to commercialize thin-film solar cells for rooftop PV application.

*Poster 18*

### ***Regenerative Capacity in a Mouse Model for Accelerated Aging***

**Ian Guang Xia**

*Faculty Advisor: Dr. Regina Brunauer*

Advanced age is the major underlying risk factor for many chronic and debilitating diseases, such as cardiovascular disease, metabolic syndrome, cancer, and osteoporosis. One driving factor of the aging process is the loss of regenerative capacity. However, the effects of aging on regenerative power are mostly studied using isolated stem cells, or single tissue types such as the intestinal lining. Therefore, very little information is available about how different cell types interact during regeneration, and how regenerative events are timed. Similar to the axolotl or salamander limb, the mouse and human digit tip are capable of epimorphic regeneration, which is the complete and near-perfect replacement of an amputated multicellular structure. To date, the effects of aging on this response are unknown. In order to study this age-related decline of regenerative power, the digit tips of a mouse model of Hutchinson-

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Gilford progeria syndrome (HGPS), a disease of accelerated aging, were analyzed at different time points in the regenerative process.

*Poster 19*

### ***Peer Mentoring as a Form of Leadership Development***

**Christine Marie McCall**

*Faculty Advisor: Dr. George Cunningham*

Formal peer mentoring programs often focus on how the mentee benefits from the mentoring relationship. However, mentoring, as a dyadic relationship, constitutes an exchange of thoughts, feelings, and experiences between both the mentee and mentor. As such, mentors have an opportunity to develop skills in leadership, communication, and influence by investing in their mentees. In building the relationship with the mentee, the mentor is allowed to practice a personal and unique form of leadership as the mentors seek to help mentees achieve their full potential. As such, this project's purpose centers around examining 350 Hullabaloo U peer mentors at Texas A&M. Drawing from the theory of experiential learning, the researcher examined how the role of peer mentoring influenced the mentor's development as a leader. In the context of mentoring first-year students, understanding how mentors progress and improve provides an opportunity to improve the support given to them. Similar to how strengthening a teacher's knowledge and skillset improves the student's experience, improving a mentor's skills might facilitate a positive experience for the mentee. These actions, in turn, promote the health of the whole program.

*Poster 20*

### ***Defining the Role of Operation Sex Ratio in Fitness of Organisms with Sexually Antagonistic Traits***

**R. David Gafford-Gaby**

*Faculty Advisor: Dr. Heath Blackmon*

In many species, populations vary in size and reproductive sex ratio, producing situations in which small population sizes are paired with strongly skewed effective sex ratios. This imbalance among sexes is particularly important in populations with traits that have different selective pressures between males and females. Understanding the role selection and drift play in such populations is important in determining the evolution of such traits and the role they play in fitness of the organisms. By simulating such populations under various conditions, we found that certain conditions allow for greater likelihood of fixing beneficial genes in the more numerous sex and fixing deleterious genes in the rarer sex.



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## Posters 21-30

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*Poster 21*

### *Static Facial Expression Recognition with Multi-layer Deep Learning*

**Sicong Huang**

*Faculty Advisor: Dr. Anxiao Jiang*

Facial recognition is very important, and it has been used in many aspects of life. It is a complex process that has not yet refined. There are many factors that can play a role during encoding, which makes the recognition not accurate enough. In addition, based on the previous research that has been done in facial recognition, the images in the facial action coding system are still very limited. My research builds on the existing methods for facial recognition and focuses on generating more accurate and diverse results by using deep learning with advanced facial landmarks technique and categorical model. With the technology of transdermal optical imaging, my project aims for a smoother and more accurate model compared to existing techniques with the help of transdermal optical imaging. This goal of this research is focusing on improving the accuracy and diversity of facial expression recognition with deep learning.

*Poster 22*

### *Depth of the Cube: Insight into the Analysis of a Shared Form*

**Jared Thome**

LAUNCH-Department of Architecture Undergraduate Summer Scholar

*Faculty Advisor: Dr. Weiling He*

The cubic form has served as a foundation for the architectural discipline, spurring on countless projects throughout the ages. By collecting numerous examples of these projects, the developmental processes of each can be studied and compared. These processes are then organized and simplified to illustrate the various design frameworks and methodologies that the architects employed to create these designs. As these are condensed and developed into series, nearly any building that is based around the cube or similar geometric primitives can be compared to and arranged with one of the frameworks put forth by my research. Rather than having to reduce projects down to one or two aspects and measuring it up against another specific project, one can simply identify which framework a project fits into and instantly have a general understanding of the building and a way of correlating it to a host of other similar projects on that shared framework. This entire discourse was spurred on by questioning where the basis of architectural analysis originates from and how it was developed. By creating a series of comparisons between systematically similar projects throughout various periods, the change in methods of approaching the design of a bounded shape become quite apparent. The development of representation becomes inherently tied to this idea as well since the method of design correlates to certain representational methods which have evolved from project to project. Creating these diagrams to illustrate each design strategy is then crucial to comparing each work. Formally analyzing these

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projects then becomes an essential aspect of understanding the development of architectural design throughout time.

*Poster 23*

### ***Active-Routing: Parallelization and Scheduling of 3D-Memory Vault Computations***

**Troy Fulton**

*Faculty Advisor: Dr. Eun Kim*

In an age where big data is more available than ever, new high-bandwidth, low-latency memory technology, such as Hybrid Memory Cubes (HMC), have extended into the third dimension to tighten the increasing gap between memory and CPU speeds. Processing power built into these new 3D memory technologies allows CPU cores to offload computations to memory, leading to recent interest in the design space of Processing-In-Memory (PIM) when several of these HMC units are chained together in a network. Using Active-Routing techniques in such a network of compute nodes, computations like dot products that are done over a large set of data can be distributed across a virtual "tree" such that partial results are compounded at every branch as they travel up the tree and back to the CPU. We propose that such aggregate computations can be further parallelized by strategically and dynamically dispatching in-memory computation to DRAM vault controllers within each HMC. Our new implementation will distribute the resources of Active-Routing to each of the vault controllers in each HMC so that more partial results will be available closer to the data at the same time, and there will be less contention for compute resources. We implement these proposed techniques and assess their performance using widely accepted benchmarks and the micro-benchmarks we developed. The evaluation results show an increase in overall data throughput throughout the Active-Routing tree.

*Poster 24*

### ***Impact of Microplastics on Soil Health: Soil-Water Retention, Shrinkage, and Holding Properties***

**Lindsey Pressler**

*Faculty Advisor: Dr. Patricia Smith*

While microplastics in the ocean have been heavily studied, their impact on soils have not. Current research suggests microplastics are just as prevalent in freshwater and land as in the ocean and should be considered a pollutant due to the potential hazardous effects. Once in the soil, the chemicals in the plastics, or even the plastic particles themselves, can be taken up by plants. Understanding whether or not microplastics and their additives change the soil's ability to retain water is a fundamental step towards determining the critical level of microplastics in cropland. This study reviews the effects of microplastics on the water retention and shrinkage and swelling of soil. Samples were collected from the A&M bioapplication field where sewage sludge has been applied, as sludge is a major vector of microplastics into soil. Samples were tested in the Pedostructure Characterization Lab for soil-water

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holding properties. Next, the amount of microplastics in the samples were quantified using gravimetric separation and sieving. Due to the changes microplastics create in density and increase in aggregates observed, it is likely that microplastics increase the water retention of soil.

*Poster 25*

### ***Quantum Optimization from a Computer Science Perspective***

**Darryl Cherian Jacob**

*Faculty Advisor: Dr. Fang Song*

Optimization problems are ubiquitous in but not limited to the sciences, engineering, and applied mathematics. Examples range from the fastest way USPS can route packages through a delivery network to the best way an autonomous vehicle can navigate through a given traffic environment. Classical optimization algorithms dominate the way we solve these problems. However, with the rapid advance of quantum computers, we are looking at novel, quantum-inspired ways of solving old problems to achieve some speedup over classical algorithms. Specifically, we are looking at the Quantum Approximate Optimization Algorithm and the Variational Quantum Eigensolver, as well as their applications to promising areas of research like Quantum Machine Learning and Quantum Chemistry Simulation.

*Poster 26*

### ***Deep Ocean Current Variability Near the Macondo Oil Spill Site***

**Hannah Marie Diaz**

*Faculty Advisor: Dr. Steven DiMarco*

Six deep ocean current mooring systems were deployed near the Macondo (Deep Water Horizon) spill site in 2012 for a period of 2 years for the purpose of defining the oceanographic current variability within the region and relate to oil spill transport prediction. I will analyze these data to produce climatological maps of ocean current speed and direction that characterize how the ocean moves as a function of depth and season (i.e., time). Progressive vector diagrams and ocean current stick plots will be principal data products that I will create and utilize to analyze the ocean current variability throughout this study. I hypothesize that there are statistically significant differences between surface and deep currents in the vicinity of the spill site which led to different fates of the oil spill remnants that remained subsurface as opposed to those that rose to the ocean surface. This analysis will have important implications for future oil spill response and mitigation in the deep ocean.

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Poster 27

## ***A Novel Spectroscopic Instrument for the Rapid Identification of Live and Dead Bacteria***

**Arjun Krishnamoorthi**

*Faculty Advisor: Dr. Peter Rentzepis*

Bacterial infections account for a considerable percentage of deaths, with health care-associated infection (HAI) among the top 10 causes of death in the United States. The current "gold standard" for the quantification of bacterial species is Colonies Forming Units (CFU) counting, which requires extensive equipment, personnel, and time (on the order of days). Such a procedure is rather unfeasible and detrimental in scenarios requiring prompt, in-situ diagnosis. To that effect, a rapid, portable means for detecting and assessing bacterial infections would prove invaluable. In this research, a novel spectroscopic instrument capable of normal fluorescence, synchronous fluorescence, and Raman spectroscopy was designed and constructed. We have utilized this instrument to investigate the effects of ultraviolet (UV) irradiation on bacteria and bacterial components. Principal component analysis (PCA) was applied to identify and distinguish live (viable) and dead (nonviable) bacteria within minutes. The results of this research are a novel means and instrument for the rapid identification of live and dead bacteria.

Poster 28

## ***The Rate of Phage DNA Replication Influences Infection Outcomes***

**James Ethan Corban**

*Faculty Advisor: Dr. Lanying Zeng*

Investigating the effects of altered DNA replication patterns (and the resultant DNA copy number fluctuation) on cellular decision-making may elucidate the impact of gene dosage on regulatory network expression. In this study, we examined the lysis-lysogeny decision of the bacteriophage lambda and *E. coli* infection cycle. Past studies have demonstrated that phage lambda DNA replication is integral to the lysis-lysogeny decision. We employed two separate strategies to alter lambda DNA replication patterns during the infection process. Nalidixic acid (NA), a quinolone antibiotic, was used as an inhibitory agent to lambda DNA replication. NA targets DNA gyrase and inhibits the enzyme's nicking-closing activity, leading to the buildup of positive supercoiling stress ahead of replication forks and a stall in DNA replication. Both *E. coli* and phage lambda rely on DNA gyrase for maintaining their respective DNA molecules in proper supercoiled states to facilitate DNA replication. We applied concentrations of NA with negligible effects on *E. coli* viability to examine the impact of NA treatment on lambda DNA replication and the lysis-lysogeny decision. The second strategy to alter lambda DNA replication centered on controlling the production of lambda replication proteins, O and P. The lambda O protein functions similarly to DnaA in *E. coli*: a sufficient accumulation of O triggers the opening of lambda's replication fork and allows for replication to begin. P interacts with host DnaB and shuttles the protein to the lambda replication fork to facilitate opening of the double-stranded lambda genome. Cells

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containing plasmids inducible for P or O expression were infected with P or O (respectively) deficient lambda phages.

*Poster 29*

### ***Deep Learning Method for Denoising Monte Carlo Renders for VR Applications***

**Aksel Taylan**

*Faculty Advisor: Dr. Nima Kalantari*

Monte Carlo path tracing is one of the most desirable methods to render an image from three-dimensional data thanks to its innate ability to portray physically realistic and desirable phenomena such as soft shadows, motion blur, and global illumination. Due to the nature of the algorithm, it is extremely computationally expensive to produce a converged image. A commonly researched and proposed solution to the enormous time cost of rendering an image using Monte Carlo path tracing is denoising. This entails quickly rendering a noisy image with a low sample count and using a denoising algorithm to eradicate noise and deliver a clean image that is comparable to the ground truth. Many such algorithms focus on general image filtering techniques, and others lean on the power of deep learning. In this paper, we propose a method utilizing deep learning to denoise Monte Carlo renders for virtual reality applications. Images for virtual reality, or 'VR' are composed of both a 'left eye' and 'right eye' image, doubling the computation cost of rendering and subsequent denoising. Our algorithm introduces a method that can effectively denoise both images, halving computation costs.

*Poster 30*

### ***Modified Computational Method and Analyses of Changes in Estuarine Convergence in South Korea Between 1985 and 2015***

**Alan Hurlbert**

Texas A&M University at Galveston

*Faculty Advisor: Dr. David Retchless*

Estuaries are an important ecosystem with high productivity and benefits to humans, such as storm protection. However, estuaries are under threat from human interference, such as the construction of dams and sea level rise. The purpose of this project is to modify an existing R Code product, to automatically process the convergence length of estuaries and provide information on how estuaries have changed over time. While the R Code scripts were shown previously to successfully process estuarine convergence, multiple errors were encountered. Resolution of the errors includes "tweaking" of the code's ability to determine the starting point of the estuary and simplification of the geometry in the input estuary data. With the addition of more convergence length data, it is expected that analyses of South Korean estuaries from 1985 to 2015 will show convergence lengths with measurable decrease due to anthropogenic structures.

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## Posters 31-40

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*Poster 31*

### *Effects of Salinity on Solid Particle Settling Velocity in Non-Newtonian Herschel-Bulkley Fluids*

**Syeda Manahil Akhter, Hadeer Hassan, and Anurag Srivastava**

Texas A&M University at Qatar

*Faculty Advisor: Dr. Ibrahim Hassan*

The purpose of this research is to have a deep understanding of the effects of salinity on solid particle settling velocity in Non-Newtonian Herschel-Bulkley Fluids. Settling velocity or depositional velocity is a very important parameter in drilling technology and hydrocarbon processing as the non-settling condition of particles depends on it. Understanding the formation damage caused by a drilling fluid will be beneficial for higher recovery of oil and natural gas. In addition, understanding the settling velocity of a Newtonian fluid with high salinity will help for better separation of oil and natural gas streams in processing facilities. There are limited studies available in the literature for Herschel-Bulkley (H-B) fluid with salinity. In this study, we will measure the fluid rheology of non-Newtonian Herschel-Bulkley (H-B) fluid with and without salinity. Experiments are going to be conducted to measure the settling velocity of a particle in different salinity conditions. From experimental results, we will find settling velocity characteristics with changing salinity in drilling fluids. In Qatar's grand challenges, it is indicated that energy should be produced efficiently. Fundamental understating of non-depositional velocity in drilling and other hydrocarbon processing will assist in efficient hydrocarbon recovery in Qatar.

*Poster 32*

### *Development of Communication Protocols on FPGA through PCIe*

**John Wright**

*Faculty Advisor: Dr. Stavros Kalafatis*

The research project I am proposing is an extension of a previous Texas A&M Senior Design Project completed in the spring of 2019 by four students. Their project was to develop protocols on FPGA through the use of PCIe. Their main areas of focus were on increasing bandwidth by aggregating PCIe lanes, reducing latency on performance critical accelerators and matching current PCIe transfer rate. My research will go even further with their project. I will take their previous design and streamline its features, improve performance mechanics and most importantly implement the package onto an FPGA. This purpose behind this project is to create a faster and higher performing PCIe protocol for data transfers, a key component in the large industry of data management and storage. The goals of this research project are to increase performance, decrease latency and improve the design of the previous project and implement it all on an FPGA board.

## *Rotational Behavior During the Pole Test: A Novel Behavioral Assay in a Mouse Model of Parkinson's Disease*

**Mariah Barry**

*Faculty Advisor: Dr. Rahul Srinivasan*

Parkinson's disease (PD) is a debilitating disorder that is likely to reach pandemic proportions by the year 2040, and there is no cure. Current treatments are symptomatic in nature and often have deleterious side effects, such as L-dopa-induced dyskinesia; neuroprotective drugs, however, prevent neuronal death, the root cause of PD. In order to develop neuroprotective drugs, a reliable and clinically translatable animal model for PD is required. The classic preclinical model for testing drugs for PD is a rodent model based on intracranial injections of 6-hydroxydopamine (6-OHDA), a neurotoxin that results in retrograde degeneration of dopaminergic axons, which eventually results in a loss of neuronal cell bodies within the substantia nigra pars compacta (SNc), the brain region lost in PD. Unilateral lesioning with 6-OHDA damages only one side of the SNc, and the extent of damage can be quantified with drug-induced rotational assays. These behavioral assays, require administration of additional drugs to induce rotations. The use of drugs, specifically apomorphine or amphetamine, to induce rotations in 6-OHDA injected rodents is problematic because of potential drug-drug interactions, especially in the setting of drug discovery. To address this issue, I developed a new behavioral assay that induces rotational behavior during a motor task, the pole test, without the need for additional drugs. Results showed that 6-OHDA significantly increased the number of rotations in both ovariectomized and sham-operated female mice without the use of any additional drug. My data suggest that spontaneous rotations while performing a specialized task such as descent down a 2-foot pole are a useful measure for the discovery of preclinical neuroprotective drugs to treat PD.

## *Orchestrate: A System Supporting Easy Substitution of Browsing Semantics Engines*

**Tate Banks**

*Faculty Advisor: Dr. Richard Furuta*

Systems of electronic media presentation are pervasive in everyday use. Browsing semantics engines are the logical backbones that dictate the form these systems take. Much research involves the development of new and novel engines to create and run new and different systems of media presentation. The Orchestrate platform is designed to allow an easy way to test these browsing semantics engines and to substitute different ones, sometimes with the same piece of media. The Orchestrate system was designed in Python and is intended to be used in many future studies with the intent of academic publication.

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Poster 35

## ***BOLO: A Software Solution to Circular Genome Alignment***

**Hannah Gooden**

*Faculty Advisor: Dr. Sing-Hoi Sze*

There are many steps to the genome sequencing process. During the alignment step, sequenced reads are matched to a reference genome. However, modern alignment software optimizes for linear genomes rather than circular ones. This means that inaccuracies are prone to occur where the genome is split when researchers use modern aligners to sequence circular genomes. Bolo is a tool which extends the functionality of a typical aligner to be more accurate for circular genomes. Bolo utilizes Samtools, which allows for efficient manipulation of SAM files, and Seqan, a library of classes and objects which creates a software representation of paired-end reads. It also utilizes a complex algorithm which manipulates reads from an alignment to bring the accuracy level up near the beginning and end of the linearized genome. Bolo can be used alongside any modern aligner which outputs in the SAM file format, and it has been tested on outputs from Bowtie and BWA. Testing has shown that Bolo can significantly increase the coverage level near the beginning and end of an alignment, thereby producing a higher level of statistical certainty for mutations that exist in these regions.

Poster 36

## ***Stereotypical Behaviors in FMR1 Knockout Mice***

**Dorothy Foster**

*Faculty Advisor: Dr. Laura Smith*

Fragile X syndrome is an inherited neurodevelopmental disorder in humans that results from the lack of fragile X mental retardation protein in the individual. Many of the individuals affected with this syndrome experience restricted interests and sensory motor behaviors, the severity of which have been linked to a brain region known as the striatum. To further study these behaviors, we will use a total Fmr1 knockout (KO) mouse. The striatum is an essential part of the basal ganglia and is responsible for motor functions of individuals. This part of the brain interprets messages from the cerebral cortex and translates it into movement. There is evidence suggesting that stereotypic behaviors are strongly influenced by an increase of dopamine in this region. Since these behaviors can be difficult to measure in the rodent, enhancing dopamine levels in the striatum with a psychostimulant drug is often used to magnify the consequences. Over the course of the study, cocaine will be administered to both Fmr1 KO mice and their wild type counterparts to determine vulnerability to the development of stereotypical behaviors elicited under various conditions.



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Poster 37

### *Recognizing Face Tilt Action Units for Analysis of Facial Expressions*

**Royce Yu**

*Faculty Advisor: Dr. Anxiao Jiang*

Facial expression recognition is an important aspect of the field of deep neural network research. In this research paper, I will develop a model for the identification of facial actions related to the tilting of the head. In order to identify such facial actions, we will first have to define the elements of such facial expressions, then identify each element, and finally, using trained neural network to identify the facial expression. This paper will demonstrate the usage of facial landmark detectors to quickly and easily identify facial action units with high precision and speed. A generic self-made data set is made for training purposes. The neural network will identify the following facial actions: face tilt right, face tilt left, head forward, and head back.

Poster 38

### *Computer On-Demand Architecture*

**Daniel Schwartz and Hung Bui**

*Faculty Advisor: Dr. Sunil Khatri*

Local hard drives are found in every conventional computer as a storage medium for all programs including the OS and potentially harmful malware. With recent advances in network speeds, data can be pulled from the internet just as fast as from these drives. Since hard drives also take both space and power from a computer, there is merit in removing this drive and replacing its function with a networked cloud database system. By demanding the computer to download a fresh OS and every program every boot cycle, security against many types of stored malware is also increased while minimizing the overall number of components. To further reduce the architecture, all local peripherals of this system such as USB and HDMI will be implemented on an FPGA to allow for quick swapping of various peripherals when not in use.

Poster 39

### *Neuropeptide Substance P Enhances Tumor Signaling Pathways, Migration and Proliferation of Head and Neck Cancers*

**Sumeet Singh and Saurabh Dhole**

*Faculty Advisor: Dr. Sanjukta Chakraborty*

Head and neck cancer (HNC) is comprised of a multitude of malignancies that take place in the oral cavity. Neuropeptides such as substance P (SP) are important in causing inflammation, proliferation and migration in different types of cell lines, but the precise effects and mechanisms are not yet elucidated in HNCs. Substance P (SP) along with its receptor, neurokinin-1 receptor (NK-1R) strongly affect the

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tumor microenvironment. In this study, the effect of SP at 100nM was observed on HNCs, including FaDu, Detroit 562 and SCC-9 cell lines. The inhibition of SP's most influential receptor NK-1R was then blocked using the drug L-703606 at concentration of 1uM. By utilizing an XTT Proliferation Assay, SP was found to significantly increase cell proliferation in all HNC cell lines tested, at the starting concentration of 100nM and throughout the increase to 10uM. Compared to untreated HNC cells lines, SP also significantly increased the expression of various cytokines, cytokine receptors, chemokines, chemokine receptors, MMP genes and EMT inducing genes at a concentration of 100nM, and the NK-1R inhibitor significantly decreased these genes compared to the SP samples, which was evaluated via RT-PCR. Furthermore, SP upregulated the migration rate of one of the randomly tested cell lines, SCC-9, at a concentration of 100nM and was inhibited by the NK-1R receptor at a concentration of 1uM, which was evaluated via migration assay and scratch wound assay. The expression of NFkB was also significantly increased in response to SP in immunofluorescence studies, and decreased when treated with NK-1R inhibitor. The effects of SP at 100nM significantly increased cellular inflammation, proliferation and migration of various HNCs, and its effects were abrogated by L-703606.

*Poster 40*

## ***Statistical Methods for Causal Networks with Observational Data***

**Sahil Patel**

*Faculty Advisor: Dr. Yang Ni*

Bayesian networks or probabilistic Directed Acyclic Graph models (DAG models) are used to illustrate direct dependencies and other relationships between 2 or more variables. Applications such as Gene Modeling and Network flow modeling rely on correctly identifying the relationships between the variables to justify usage in their respective fields. We will demonstrate an algorithm to correctly identify the structure in the scope of large-scale Gene Modeling data. However, our general algorithm structure can be applied to model any large data-set's variable dependencies.

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## Posters 41-49

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Poster 41

### *Yawning Detection Using Computer Vision*

**Sarvesh Mayilvahanan**

*Faculty Advisor: Dr. Anxiao Jiang*

A model to detect yawning in a video sequence from a regular camera is proposed. Landmark detectors are able to quickly and accurately estimate the pose of a face with various amounts of light and facial expressions. We can show that the information from these landmark detectors is useful in being able to detect when a person is yawning. The proposed model is therefore able to take in information from the landmark detector and process it by creating new features to characterize the yawning in each frame. An SVM classifier then detects eye blinks as a pattern of the constructed feature values in a short temporal window. We made a dataset and annotated it to train and test the model, which is composed of frames from several videos that include a person yawning and not yawning and different angles to the camera.

Poster 42

### *Direct Revelation Under Lying Aversion*

**Ethan Park**

*Faculty Advisor: Dr. Alex Brown*

Mechanism design theory is a subfield of economics where a "designer" creates a way to maximize strategy for people around a desired objective. It is often applied to situations where individuals have private information and the designer desires to incentivize them to reveal that information. The theory relies heavily on the idea of direct revelation. That is, if certain conditions are met, a mechanism designer can always design a mechanism where individuals have proper incentives to report their private information truthfully, directly to the designer. Repullo (1985) notes that in such situations, revealing the truth is not uniquely incentive compatible. Strategies where an individual does not reveal information or reveals incorrect information, may also generate the same payoffs as truthful revelation. The proceeding analysis, however, neglects that direct revelation mechanisms make not revealing one's private information an explicit lie. Recent research has shown people are lying averse; it is as if they suffer monetary costs from not telling the truth. We investigate these mechanisms both for the indirect mechanism and the direct mechanism in incomplete information. We predict substantial evidence of lying aversion. Thus, Repullo's concern of direct mechanisms in this context may have been less relevant than previous thought.

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Poster 43

## *Isoleucine Treatment and its Effect on Metabolism in Subjects with Type 2 Diabetes*

**Ellie Parker**

*Faculty Advisor: Dr. Traver Wright*

Over 29 million Americans are diagnosed with Type 2 diabetes, a disease that affects about nine percent of the population. Type 2 diabetes (T2D) is associated with chronic systemic inflammation and increased oxidative stress, resulting in altered mitochondrial function including changes in respiratory capacity of peripheral blood mononuclear cells (PBMCs). Mitochondrial respiratory capacity is vital to cellular oxygen consumption in order to produce energy in the form of adenosine triphosphate (ATP) via the tricarboxylic acid (TCA) cycle and mitochondrial electron transport chain (ETC). Metabolic dysfunction associated with systemic inflammation can lead to limited production of TCA cycle intermediates which are vital for metabolism. Providing TCA cycle precursors, specifically the branched chain amino acids isoleucine and valine, has been shown to replenish TCA cycle intermediates to allow for the continuation of function in metabolically active tissues and cells. The purpose of this study is to assess the respiratory capacity in PBMCs in subjects with T2D and determine if isoleucine supplementation promotes the TCA cycle to combat the metabolic consequences of insulin resistance. Data collection is ongoing, but preliminary results from data analysis have not indicated a significant difference in mitochondrial function between the pre and post results of isoleucine supplement for patients with T2D.

Poster 44

## *Home Sweet Home? Neighborhood Cohesion Offers a Coping Mechanism for Gender Discrimination Linked with Psychological Distress*

**Chloe Harrison**

Glasscock Summer Scholar

*Faculty Advisor: Dr. Adrienne Carter Sowell*

Despite recent progress in the past few years gender discrimination is still an ongoing problem. Eric Grollman's work states that experiencing gender discrimination can have a negative impact on one's mental health causing stress and mental distress for the individual. Leonard Pearlin's works argues that coping works to alter or handle the meaning of the situation from which stressors occur or to not allow stress to go out of a manageable reach. I argue that social networks can impact the relationship between experiencing gender discrimination and the mental distress that is caused by the stress of experiencing discrimination. Gender discrimination impacts mental health and neighborhood cohesion influences the relationship between gender discrimination and psychological distress by operating as a coping mechanism for the added stress caused by gender discrimination. Neighborhood cohesion may act as a coping mechanism to alleviate the stress that comes with experiencing gender discrimination. This research examines the importance of coping with discrimination and what can be done to alleviate the added stress an individual experiencing because of discrimination. It explores whether social

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neighborhood cohesion, more precisely social networks, act as buffer for the relationship between gender discrimination and mental distress. The results demonstrated that women who reported higher levels of gender discrimination report worse mental health and more likely to experience psychological distress than women reporting lower levels of gender discrimination, and greater levels of neighborhood cohesion will decrease the likelihood of experiencing psychological distress, and that neighborhood cohesion did buffer the impact of gender discrimination on psychological distress.

Poster 45

### ***Development of Protocols to Test the Ability of Akkermansia muciniphila to Rescue Gut Barrier Integrity and Metabolize AOM***

**David Saucedo**

*Faculty Advisor: Dr. Clinton Allred*

The recent discovery of the bacterial species *Akkermansia muciniphila* (*A. muc.*) and subsequent studies have proposed a correlation between gut health and the presence of *A. muc.*, however conflicting reports of enrichment of *A. muc.* in colorectal cancer (CRC) patients remain. Studies that determine if *A. muc.* is beneficial to colon health and the prevention of CRC must be conducted. This pilot study tested protocols to deplete the gut microbiome and transplant donor feces lacking *A. muc.*, *A. muc.* alone, or both. Additionally, the ability of *A. muc.* to metabolize a chemical carcinogen, azoxymethane (AOM) and initiate CRC was tested. A cohort of 15 wild type, C57BL/6J, female mice were given a defined diet and antibiotic cocktail for 30 days. Once sufficient gut microbial depletion was achieved as confirmed by qPCR, animals were gavaged with vehicle, *A. muc.*, or feces lacking *A. muc.* (n=5). After 3 weeks of once weekly treatments, AOM was injected 12 hours before termination to determine the ability of *A. muc.* to metabolize AOM and initiate CRC. qPCR confirmed successful colonization and persistence of *A. muc.* in the *A. muc.* treated group alone, with reduced presence in animals that received vehicle or fecal transplant. Animals that received *A. muc.* alone had increased DNA damage in colonic crypts compared to vehicle or fecal transplanted animals. *A. muc.* treated and fecal transplant groups had a similar percentage of colonocytes that were both apoptotic and DNA damaged, indicating that DNA damaged cells die before they can become cancerous lesions. This pilot study established successful protocols for testing *A. muc.*'s role in colon health and CRC development.

Poster 46

### ***Increasing Hamstring Strength & Flexibility During Developpé and Grand Battement in Collegiate Dancers***

**Emily Bowlin, Taegan Besancon, and Adia Richardson**

*Faculty Advisor: Dr. Christine Bergeron*

Strength and flexibility are valuable for healthy dancers, and possessing this in the lower extremities is invaluable. The hamstring is an important muscle group to dancers because it assists in knee flexion and hip extension, and helps maintain many classical positions in dance such as attitude derrière and

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arabesque. Additionally, the hamstring is a common injury in dance caused by insufficient warm up or lack of flexibility and/or strength. In order to combat these inefficiencies, this study was developed to explore different ways to increase flexibility and strength in the hamstrings utilizing various Pilates exercises. The purpose of this study was to analyze the difference between strength and flexibility training and its effect on a dancer's hamstrings during développé a la seconde, arabesque, and grand battement. The subject pool was selected from a group of volunteer dance program students. The participants had to participate in a dance technique course at Texas A&M University, as well as be injury free in the lower extremities for the past 6 months. 3 subjects completed the study. These dancers were randomly placed into either a strength group, flexibility group, or control group. Throughout the course of the study, dancers were given exercises that corresponded to their selected groupings and performed these exercises after going through a warm-up protocol. This seven week study was conducted using pre and post testing, including hamstring flexibility and strength tests. Hamstring flexibility will be measured using the Sit and Stretch Test and height measurements in arabesque, développé devant and grand battement a la seconde. Strength pre-tests will include a Pilates EXO Chair Test, a Manual Muscle Hamstring Test and a Duration Test in développé devant. The subjects underwent a training week, followed by 4 weeks of intervention. During the first week of the study, the participants underwent pre-test. This included a warm up, the Straight-Leg test utilizing a goniometer, the Sit and Stretch test, a Hamstring Manual Muscle Test, Developpe and Grand Battement, and the Pilates Exo Chair. Following the pre-testing, the participants attended 3 training sessions to learn the exercises including the proper alignment timing, and breath. The following four week consisted of intervention. The intervention exercises for the flexibility group utilized the Balanced Body Pilates Reformer. The participants worked through Elephant, Seated hamstring extension, Up-Stretch in arabesque, front splits, Russian Splits, and Eve's lunge. The intervention exercises for the strength group utilized the Pilates Exo Chair. The strength group performed a Bridge with a hamstring pump, First position leg pump with a bridge, Swan, Hamstring Pumps, Push-ups with leg pumps, and a hamstring stretch with a torso lift. The last week of the study included the post-test, which included a warm up, the Straight-Leg test utilizing a goniometer, the Sit and Stretch test, a Hamstring Manual Muscle Test, Developpe and Grand Battement, and the Pilates Exo Chair. At the pre-testing phase, we had 2 dancers in the flexibility intervention group, 2 dancers in the strength intervention group, and 1 dancer in our control group. Due to injuries outside of the study, 1 dancer completed the flexibility intervention, 1 dancer completed the strength intervention, and 1 dancer finished as our control group. \*This study is ongoing, and the data has not been analyzed at this time.

*Poster 47*

## ***Deep Reactive-Ion Etching Process Development and Mask Selection***

**Ethan Morse**

*Faculty Advisor: Dr. Arum Han*

Deep reactive-ion etching is an important process in the fabrication of microelectromechanical system devices, through-silicon vias, and DRAM capacitors, among other devices and components. High-quality etching is a crucial step in device fabrication, where the etch quality is determined by three properties:

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aspect ratio (ratio of depth of etched feature to width of etched feature), selectivity (ratio of desired material's etch rate to etch mask material's etch rate), and sidewall profile (angle relative to feature bottom and sidewall roughness). A cryogenic-temperature deep reactive-ion etching process is developed to obtain 90°, smooth sidewalls and maximize the selectivity and aspect ratio through the optimization of sulfur hexafluoride and oxygen gas flow rates, radio frequency power, and inductively-coupled plasma power on a (111) silicon substrate. The micro-loading and aspect-ratio-dependent etching effects and their impact on etching rates are also examined. Additionally, etch mask behaviors of selectivity and tendency to crack are characterized for 100 nm electron-beam evaporated chromium, 500 nm thermally-grown silicon dioxide, and 1.2 μm thick post-develop-baked AZ 5214 E-IR photoresist. The experimental results provide insight on how to adjust the etching process according to the specific device application and which material and film thickness is best to use as an etch mask.

*Poster 48*

### ***Electrical Reactivation to Cure Neurogenic Bowel in a Closed-Loop System***

**Ethan Vargas**

*Faculty Advisor: Dr. Hangu Park*

We have developed a closed-loop electrical stimulation system to activate the movements of the colon. Specifically, the system stimulates the serosal surface of the colon in the caudal direction, causing peristaltic movements to occur down the bowel. The system has been designed to mimic the natural stimulations given to the bowel for its movement. Validation of the system was done within a mouse model. A conscious mouse's natural bowel movements were successfully monitored in a semi-closed-loop system and implemented into the final closed-loop electrical stimulation system. The results of the system's performance for a mouse model suggest that this system can be used to develop a larger scale closed-loop electrical bowel stimulation system in order to cure neurogenic bowel dysfunction in humans, ultimately bringing back the natural movements and functions of the bowel for people who have lost them.

*Poster 49*

### ***A Century of Genocides and Justice: A Comparative Study***

**Rachel Hage**

*Faculty Advisor: Dr. Richard Golsan*

The objective of this research is to compare how genocides over the past 100 years or so have come to an end, and what forms of justice were then carried out in regards to the party deemed responsible. The crimes of committing a genocide has been discussed at great length in international courts and at conventions hosted by the United Nations. However, the convention policies still remain vague on how to charge the crime of genocide, and throughout history the execution of these policies have varied. By further investigating the trials of a post-genocide regime, this paper will attempt to identify the goals of each trial and how the type of court system used to conduct each case played a role. This will contribute

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to ongoing research of genocides because it adds further analysis on how to best approach genocide as a crime and the impacts that previous implementations are carrying in to society today. This is a relevant study because genocides continue to be a crime committed within our time and without a standard of consequences. By pursuing my research in a comparative study of the modern era, I hope to analyze a less tackled aspect: the conclusion of a genocide and the condemnation, or lack thereof, following the genocide to study this further, I will be focusing my research on the era of the 1900's to present, and discussing what methods were used in carrying out justice following an assortment of genocides. Because genocide is a crime that still takes place today, there are justice systems in place to charge those deemed guilty of genocide or crimes against humanity; this paper will further explore those systems and the consequences of each.



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# Poster Session 2: 3:00 PM-4:00 PM

Room: MSC 2300 A-B

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## Posters 1-10

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*Poster 1*

### *Measure Effects of a Medical Screening Exam and Referral System on Emergency Department Admissions*

**Douglas Fletcher**

Academy of Undergraduate Researchers Across Texas, Texas A&M University, and Explorations Editorial Board Member

*Faculty Advisor: Dr. Murray Côté*

Emergency Department (ED) overcrowding due to non-urgent ED visits remains a problem in the United States. The use of affiliated, primary health clinics is a reasonable alternative care setting for non-urgent patients. Four rural hospital-based EDs in Texas implemented a novel medical screening examination (MSE) program in 2011. The MSE was designed to identify non-urgent patients and we were tasked with identifying the effect of the MSE. As a retrospective study, relevant ED visit information was extracted from the phased rollout of four rural hospital facilities from the calendar years 2011-13. The primary outcome measure for this study was the rate of Emergency Severity Index (ESI) level 4 or 5 (the two least-severe triage categories) ED arrivals per month. A statistical process controls approach was utilized to understand rates of non-emergency entries into the system. MSE implementation was associated with decreased rates in each study hospital. The MSE program offers a promising solution for the ED overcrowding issue, and may be implemented in other rural settings. The MSE strategy can help reshape the rural health delivery system and provide less expensive, more effective access to non-emergency healthcare services for rural populations.

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Poster 2

## ***“My Master Met Me at Every Turn”: Surveillance and Psychological Domination within the Plantation Household***

**Zaria El-Fil**

Academy of Undergraduate Researchers Across Texas, The University of Texas at Austin

*Faculty Advisor: Dr. Daina Ramey Berry*

In *Incidents in the Life of a Slave Girl*, Harriet Ann Jacobs wrote of her experience within her enslavers' home “my master met me at every turn, reminding me that I belonged to him, and swearing by heaven and earth that he would compel me to submit to him.” Living within the house of bondage has long been understood as a mild alternative to the grueling labor undertaken by men in the field. However, the house represented a geography of terror that forced enslaved people to have direct access and contact with the very people who oppressed and tortured them. Aside from being a place for child-rearing and rest, the plantation household was an active working site with rigid schedules and harsh punishments. White women practiced dominance within the home, delegated workloads, and relied heavily on the work of enslaved women to uphold their status in Southern society. Through an analysis of slave narratives and planters' journals, I argue that such relations within the plantation household (particularly between Black and White women) are important to understanding southern slave holding society at large. In order to accomplish this, insights from surveillance studies, psychology, and history are blended and utilized to provide a deeper understanding of slavery and womanhood across colorlines.

Poster 3

## ***Forgiveness and Punishment***

**Tory Martin**

Academy of Undergraduate Researchers Across Texas, Texas A&M University and Glasscock Summer Scholar

*Faculty Advisor: Dr. Linda Radzik*

In this thesis, I will answer the question on whether one can forgive while punishing her wrongdoer. I will create an account of forgiveness and punishment which I find to be the most accurate, in order to determine whether or not forgiveness and punishment are compatible. Discovering this relationship will assist us in better understanding our human condition, revealing how we ought to behave after wrongdoing, and can have policy implications. In order to discover the compatibility or incompatibility between forgiveness and punishment, I will propose a new theory of forgiveness, in which both emotion and action play equal roles in the process of forgiveness. Unlike Jeffrie G. Murphy and Leo Zaibert, who solely focus on either emotion or action, I believe that the two are both essential to forgiving and further add constructive and conditional elements of forgiveness. After defending my account of forgiveness, I will move into defining punishment, both criminal and social, in order to determine whether punishment is compatible with forgiveness. Finally, I will analyze how forgiveness and

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punishment together to determine whether one can forgive while continuing to punish or if one must forgo punishment to forgive properly.

*Poster 4*

### ***Novel Loop-Mediated Isothermal Amplification via One-Step Strand Displacement Diagnostic for Rickettsial Diseases***

**Simren Lakhota**

Academy of Undergraduate Researchers Across Texas, The University of Texas at Austin

*Faculty Advisor: Dr. Timothy Riedel*

Rocky Mountain spotted fever (RMSF) can be a deadly tickborne illness if not treated early, with the mortality rate increasing greatly if treatment is not administered within five days (CDC, 2017). RMSF is found in very low traces in the blood, making it difficult to diagnose. A short diagnostic window paired with nonspecific symptoms, makes RMSF a good candidate for a developing DNA amplification process known as loop-mediated isothermal amplification through one-step strand displacement (LAMP-OSD). LAMP-OSD amplifies DNA with high specificity, efficiency and rapidity under isothermal conditions. The goal of this study is to replicate the work of Bruce Noden and amplify a sequence of the *R. rickettsii* gene via LAMP-OSD. The difference is that a fluorescence detection will be utilized as opposed to gel electrophoresis. This allows the results to be analyzed more quickly and with simpler-to-access technology. The assays were incubated over the course of an hour and a half to allow for amplification. Each assay was recorded every three minutes to keep track of the amplification. The positive control of  $10^4$  copies/ $\mu\text{L}$  began significant amplification around the 30-minute mark. Whereas the negative control of *Enterococcus* at  $10^4$  copies/ $\mu\text{L}$  did not amplify at a detectable level. The positive control of  $10^3$  copies/ $\mu\text{L}$  has shown potential to fluoresce as well. It was observed that the positives amplified, without creating false positives out of the negatives. There was a distinct difference in the level of fluorescence within our samples, making this a rudimentary, functioning LAMP-OSD diagnostic.

*Poster 5*

### ***Efficacy of Silver Ibuprofen Against Bacterial Skin Pathogens: A Potential Treatment for Surgical Site Infections***

**Morgan James Chapman**

Academy of Undergraduate Researchers Across Texas, Texas A&M University, and LAUNCH Undergraduate Research Ambassador

*Faculty Advisor: Dr. Carolyn Cannon*

Each year, hundreds of thousands of Americans are affected by surgical site infections (SSIs), resulting in billions of dollars spent on additional healthcare and thousands of lives lost. These SSIs are often caused by *Pseudomonas aeruginosa*, *Staphylococcus epidermidis*, and methicillin resistant *Staphylococcus aureus* (MRSA), opportunistic pathogenic bacteria present in the skin flora. During surgeries, the site of

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incision traditionally maintains its sterility through the use of hygienic practice and chemicals. However, sterility may be compromised due to the intercalation of pathogenic bacteria into the site of incision from the crevasses of the skin thus leading to infection. Due to the secretory nature of wound sites, it is possible to use an elution-based delivery system for the direct and continuous delivery of silver ibuprofen (AgIBU), a potent antimicrobial with anti-inflammatory effects. Using electrospinning techniques, nanofiber scaffolds loaded with AgIBU were constructed and subjected to release studies. Results displayed drug release significantly higher than needed to inhibit clinical strains of *P. aeruginosa*, *S. epidermidis*, and MRSA. Thus, AgIBU based nanofiber-elution therapy may allow for the direct and continuous treatment of pathogenic bacteria in the skin flora, reducing SSIs and inflammation at wound sites.

Poster 6

### ***Syndecan-1 and its Contacts when Endothelial Cells Experience Shear Stress***

**Victoria Milosek**

Academy of Undergraduate Researchers Across Texas, The University of Texas at Austin

Faculty Advisor: Dr. Aaron Baker

Vascular endothelial cells (ECs) serve as a barrier between blood and tissues as well as control the degree of vascular relaxation and constriction. ECs are continually exposed to mechanical forces like circulation, blood pressure, and shear stress, which plays a critical role in regulating ECs function. Syndecan-1 (SDC1) is a transmembrane cell surface proteoglycan that is known to play a role in flow sensation in arteries as well as to control the inflammatory phenotype of ECs. However, it has yet to be determined if SDC1 is a mechanosensor that responds to blood flow and transmits the physical cues to downstream pathways. In this study, HUVECs were transduced with 3xHA-SDC1. The cells then underwent shear stress at 12 dynes/cm<sup>2</sup> for a duration of 15 minutes. A co-immunoprecipitation assay was performed to pull down a set of proteins that are known to bind to SDC1. Subsequent Western blots showed that shear stress induced SDC1 binding to  $\beta$ -actin and Src. Immunostaining for SDC1 as well as  $\beta$ -actin and Src after shear stress also indicated the increased co-localization. These results suggest that shear stress leads to rapid linking of SDC1 in the cytoskeleton and triggers a possible pathway beginning with the Src family. These findings support that SDC1 may serve as a mechanosensor when endothelial cells experience shear stress, promoting its binding to actin and related signaling pathways compared to static conditions.

Poster 7

### ***Dreams of Loneliness: Female Agency in Middle English Adaptations of the Dido Myth***

**Ryan Randle**

Academy of Undergraduate Researchers Across Texas, Texas A&M University and Glasscock Summer Scholar

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*Faculty Advisor: Dr. Britt Mize*

The figure of Dido from Virgil's Aeneid was widely present in the courtly literature, religious rhetoric, scientific thought, and treatises of proper kingship throughout the medieval period. Dido's depiction within these sources varied from tragic heroine, to an exemplum of a virtuous pagan woman, to a misguided lover, or to a malicious seductress of Aeneas. This paper examines the classical constructions of Dido in comparison to a selection of medieval poetic works from the fourteenth- through sixteenth-century England; Chaucer's House of Fame and his Legend of Dido, William Caxton's Eneydos, and Gavin Douglas' Middle Scots translation of the Aeneid, Eneados. While the current discourse surrounding Dido in medieval literature has focused on her as an obstacle or foil to Aeneas, this paper will shift from considering Dido in relation to him to considering her in conjunction with the other women in these narratives. Though the majority of individuals who do come into direct or indirect contact with Dido in Virgil's narrative are in fact women, including Juno, Venus, the goddess Fama, the Massylian Priestess, and her younger sister Anna there is an absence of current scholarship surrounding Dido's female relationships in classical and medieval sources, which prevents a comprehensive picture of the construction of Dido as a dangerous, admirable, or conflicted female figure. This project investigates how the other women in these narratives contribute and hinder the efficacy of Dido and one another.

*Poster 8*

## ***Nozzle-Based Powder Deposition Device for Multi-Material Powder Bed Fusion***

**Andres Najera**

Academy of Undergraduate Researchers Across Texas, The University of Texas at Austin

*Faculty Advisor: Dr. Joseph Jefferson Beaman Jr.*

Additive manufacturing (AM), popularly known as 3D printing, has seen countless applications in the energy, automotive, and medical industries - to name a few. This project focuses on establishing fundamental processes for creating multi-material parts by using Powder Bed Fusion (PBF) techniques. Currently, PBF machines are limited, as they do not allow for the integration of more than one material. This hinders the advancement of new, innovative part designs. A multi-material PBF machine would allow for the mapping of material properties to the desired functional requirements of a part. The research objective is to redesign the existing Powder Deposition Device (PDD) of the PBF machine to enable multi-material part creation. By applying the engineering design cycle, the powder deposition device (PDD) was built using the electronics of a commercial 3D printer and machining the rest of the mechanical components. Initial PDD prototypes were cumbersome and did not translate as smoothly as desired. By adding more support structures, the newest PDD prototype fixed these issues by evenly distributing the weight. Successful integration of mechanical and electrical design considerations resulted in the near completion of a compact PDD. This enables the operator to safely deposit a wide range of powdered materials onto the same powder bed. Ultimately, this enables the collection and analysis of the chemical bonding data on multi-material AM parts. Once the latest PDD is installed, the next step in this research project is to design and troubleshoot multiple nozzle attachments to enable powder delivery. Attached to the PDD, these nozzles will allow for different powdered materials to flow onto the SLS machine. Foreseeable improvements on the nozzle designs include adjusting nozzle height

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and diameter of powder outlet hole. Implementation of these upgrades will allow for reevaluation of the research objective.

*Poster 9*

### ***Exploratory Analysis of Household's Susceptibility to Infrastructure Services Disruptions Caused by Natural Hazards***

**Natalie Coleman**

Academy of Undergraduate Researchers Across Texas, Texas A&M University, and LAUNCH Undergraduate Research Ambassador

*Faculty Advisor: Dr. Ali Mostafavi*

Natural hazards place tremendous pressure on critical infrastructure systems by testing their service reliability under extreme conditions. System failures are inevitable during harsh events, and prolonged disruptions could pose a serious risk to the mental, physical, and emotional well-being of community residents. There is an increasing need to enhance the resilience of infrastructure systems by incorporating the societal needs and expectations of individual households. Invested stakeholders such as community leaders, emergency planners, and utility managers can better prioritize and restore infrastructure services for the public by knowing the communities' ability to tolerate to such disruptions. However, there is a lack of empirical data for considering the human experience regarding service disruptions. Thus, the research performed an exploratory analysis of empirical data collected from affected communities in three disastrous events to provide a holistic understanding of the disaster experience. The temporal and physical context includes eight different infrastructure service disruptions caused by Hurricane Harvey (2017), Hurricane Michael (2018), and Hurricane Florence (2018). Various underlying factors were factored into the ability of residents to respond to and withstand the service disruptions. The results highlighted that despite the consistency of some influencing factors in the ability of the households including the degree and type of susceptibility to the disruptions vary among the communities. These differences call for devising risk mitigation plans which are developed by considering the specific needs, resources, and contexts of the communities along with the relative location and disaster characteristics. The findings also demonstrate the need to integrate the social dimensions in disaster mitigation and planning practices in order to make improvements on the current condition of the infrastructure systems to address inequalities in risks experienced by the residents due to disasters.

*Poster 10*

### ***Identification of RNA Oxidation as a Novel Biomarker of Air Pollution Exposure***

**Jamie Chualo-Abraham**

Academy of Undergraduate Researchers Across Texas, The University of Texas at Austin

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*Faculty Advisor: Dr. Lydia Contreras*

Air pollution exposure is a prominent contributor to pulmonary diseases, causing eight million deaths annually. Among air pollution effects, oxidative stress leads to chemical and/or structural alterations in cellular components. Despite discrepancies in structure that makes RNA more susceptible to oxidation than DNA, RNA oxidation remains unclear; therefore, it is important to identify biomarkers that provide early identification of environmental exposure and/or disease progression. As chemical RNA damage is an established, environmentally-related biomarker, we aim to identify signatures of air pollution exposure with a novel technique combining 8-oxoguanosine (8-oxoG) immunoprecipitation with RNA sequencing. We hypothesize the most predominant RNA oxidation mark, 8-oxoG, can be used as a potential early biomarker of air pollution. After exposing human lung epithelial cells to relevant ambient pollutants, this approach identified 555 consistently oxidized transcripts, which were then characterized using biochemical and microscopy methods, validating the markers were environmentally induced. Our results show air pollution causes 8-oxoG chemical modifications, affecting important metabolic and structural functions of epithelial cells. These distinguished signatures of air pollution can now be used for the development of diagnostic and therapeutic tools preventing lung diseases.

## **Posters 11-20**

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*Poster 11*

### ***Progress toward the Absolute Asymmetric Synthesis of Homochiral Peptides***

**Faris Zaibaq**

Academy of Undergraduate Researchers Across Texas, Texas A&M University

*Faculty Advisor: Dr. Daniel Singleton*

Nearly all molecules in the universe inherently have a “handedness” property known as chirality due to their 3-Dimensional structure. Two molecules with identical chemical compositions can be “L-” and “D-” mirror images of each other, which behave differently in a living system. The exclusive synthesis and use of L-amino acids by cellular machinery is a ubiquitous biological feature of nearly all organisms. This indicates that homochiral L-amino acids may have existed before the appearance of life. Understanding how this homochirality originated is a key component of any theory regarding the origin of life. However, this is a non-trivial problem. In the absence of a chiral catalyst to promote the formation of a specific mirror image, most chemical reactions generate an equal mix of the two enantiomers. Peptides produced from such racemic solutions would be prohibitively unlikely to afford the required homochiral peptides. It has at times been suggested that this step, the generation of homochirality, is an insurmountable problem. However, a number of chemical processes have been identified that can generate non-racemic products from achiral reactants. The Soai reaction is particularly notable because of its ability to produce homochirality intrinsically, via asymmetric autocatalysis. It produces an enantiomeric excess from achiral starting materials, and thus can be utilized to generate chirality. The Soai reaction itself could not plausibly happen on a primordial earth, and its product is not an amino acid, but it is an example of a chemical reaction which could have led to the homochirality required by

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life. Toward that end, my research has focused on the conversion of the Soai product into homochiral polypeptides of the L-amino acid valine.

*Poster 12*

### *Investigating the Needs of Low-Income, First-Generation Students*

**Nariko Nakachi**

*Faculty Advisor: Dr. Robert Garcia*

This study aims to investigate the health programming needs of first-generation, low-income college students. Specifically, we want to understand what these students see as their biggest challenges to being healthy in college and how we could possibly empower them to use resources available to them. Our goals include being able to find common themes in what students may be struggling with and being able to deliver health promotion messaging tailored to this demographic of students. Students registered in a living-learning-community at Texas A&M University will be recruited to participate in a focus group, surveying, and a health promotion presentation tailored to those who are first-generation, low-income. The focus group discussion was primarily about health behaviors and knowledge and what may have been influences in the lives of the participants. After the focus group, a pre-survey went out to students to complete before receiving the health promotion messaging. The post-survey will be sent out after the health promotion messaging occurs. Data analysis incorporated qualitative results from the focus group as well as quantitative results from the surveys. Future research should consider exploring the needs of first-generation, low-income students in other geographical areas. Possible studies should also incorporate longer term interventions in their research guided by the focus group and survey results.

*Poster 13*

### *Entourage*

**Francisco Anaya, Jr.**

LAUNCH-Department of Architecture Undergraduate Summer Scholar

*Faculty Advisor: Dr. James Tate*

This project proposes to create various digital depictions of a populated architectural drawing through the usage of the entourage in architecture. Entourage in architecture is the usage of people, and other inanimate objects in architectural drawings to showcase a set building/project in our reality which has traditionally been used to convey scale. This research is important because it will showcase a new drawing convention in architecture of the populated drawing and a recent phenomenon of viewing them at a larger scale through the agency of the entourage and its implication and connection to the normality and biases of society. Presenting entourage in a new light by progressing it beyond its traditional use. This project builds upon past research done in the architectural field by using the research of populated drawings, mainly Dora Epstein Jones "Little People Everywhere: The Populated



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Plan", as a guide that will influence the final drawing. And drawing references of previous populated drawings such as "The Garden of Earthly Delights Triptych" by Hieronymus Bosch and "A Situation Constructed from Loose and Overlapping Social and Architectural Aggregates" by MOS architects. These drawings show strategic ways of using the entourage based on a subject/idea. Which will further the ideas of using entourage as an entity beyond scale. The expected outcome of this research project is to produce digital drawings based on a new drawing convention in architecture known as a populated drawing. Then drawing a connection between the entourage and its implication to society and emphasizing the ability of these drawings to make a type of proclamation. My personal motivation stems from my architectural background and a vast interest in the entity of architecture.

*Poster 14*

### ***Anticancer Effect of Physically Fractionated Bioactive Compounds of Green Coffee Bean in Ovarian Cancer Cell***

**Youngjun Park**

*Faculty Advisor: Dr. Dongjin Kim*

Ovarian cancer is one of the leading causes of female cancer death worldwide. Current treatment of the disease is by chemically-produced synthetic drugs; However, chemical drugs mostly have toxicity that are harmful for substantial treatment. Physically-extracted green coffee bean (GCB) extract may have anticancer effect to ovarian cancer cells by the substances of caffeine, chlorogenic acids, and specific proteins. In order to validate dose dependent cell killing efficacy of the physically fractionated GCB extract,  $3 \times 10^4$  cells of ovarian cancer cell line (A2780) were seeded in a 96 well plate and were treated with the GCB extract in various concentrations from 0.1  $\mu\text{g}/\text{mL}$  to 3000  $\mu\text{g}/\text{mL}$  for 24 hours. With the findings of cell-killing efficacy to ovarian cancer, the naturally-fractionated GCB extract may be used in the development of novel anticancer drugs. Distinct and physical extraction method of our research allows higher yield of significant substances than most of chemical extraction method. Furthermore, our method is also environmentally friendly in greater extent compared to the general chemical extraction method.

*Poster 15*

### ***Vibrotactile Feedback for Understanding Numbers from Wearable Devices***

**Lina Zhang**

*Faculty Advisor: Dr. Tracy Hammond*

When people are busy or do not have easy access to a mobile device, actions such as checking the time on their phone or the minutes left before an event starts can be difficult or even dangerous in busy situations. One solution to this is to use vibrational patterns so that users can feel the numbers, but complex sequences of vibrations often take a long time to express. This study uses vibrations to test how to convey numeric values so that users can recognize messages with numbers easily and quickly. The focus is on how much of an impact overlap in a vibrotactile pattern from a wearable device has on a

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user's ability to understand it. A wearable glove with vibrotactile sensors placed on strategic locations is used to test vibrations. Information on the reaction time of the user, the accuracy of the response, and the effectiveness and usefulness of the device were collected to determine the optimal vibration presentation.

*Poster 16*

### ***Effects of Heterogeneity in Lithology and Mechanical Properties on the Slip Behavior of the Plate Boundary Fault at the Hikurangi Margin***

**Alexi Allen**

*Faculty Advisor: Dr. Hiroko Kitajima*

Subduction zones produce large, damaging earthquakes but also experience slow-slip events. Understanding the mechanisms that influence this variation of slip rate occurs will allow us to better anticipate how the subduction zone will act. While the seafloor sediments make up a small portion of the subducting oceanic plate, they can have a noticeable impact on its ability to affect both large earthquakes and slow-slip events. Cores recovered by the International Ocean Discovery Program (IODP) from the Hikurangi Subduction zone near New Zealand were scanned using X-ray fluorescence (XRF) to obtain their chemical composition. Combining the XRF data with in-situ measurements of porosity, p-wave velocity, and drilling parameters, as well as lab tests to determine how the p-wave velocities change with pressure, will allow us to compare the rock properties to the composition of the subducting sediments. The preliminary results show a strong correlation between calcium content, porosity, and p-wave velocity for the volcanoclastic cores. There is also evidence to suggest that the torque on bit during drilling is an indication of rock strength as it increases sharply when the calciferous-volcanoclastic boundary is reached. Triaxial compression tests in the lab should confirm and quantify the rock strength of the volcanoclastic materials in Mohr space. This research adds on to previous studies into the rock properties of subducting seamounts and the composition of sediments by tying these two important slip factors together and giving us a more comprehensive view of the processes that generate slow-slip and fast-slip events.

*Poster 17*

### ***Structural Analysis of the Interactions Between Collagen and Collagen-Binding Proteins***

**Michael Tang, Aaron Kim, and Mitchell Hsu**

*Faculty Advisor: Dr. Wonmuk Hwang*

Collagen plays several key roles in cell binding, tissue growth, and structural strengthening for the body. While it has the potential to optimize health and address physiological needs, collagen's binding with various proteins is less understood. The objective of this study was to determine and understand more about the interactions of certain proteins when they bind to collagen. A better grasp of OSCAR, MMP-

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12, MMP-14, DDR2,  $\alpha$ 1 integrin, and  $\alpha$ 2 integrin proteins has been developed through literature review. These proteins and protein domains have been modeled through CHARMM and visually represented in VMD computer software. Dynamic modeling was utilized in conjunction with the Texas A&M High Performance Research Computing clusters to achieve reasonable statistical trajectories of some of these chosen proteins. In addition, visual inspection played a vital role in finding and analyzing binding sites. There may be significance in comparing the binding sites of the solvated proteins compared to the crystallographic proteins. Further examination of these proteins in comparison to other species may also be performed. Observations have been made regarding the secondary structures of these proteins. Because structure determines function with regards to proteins, the different morphologies of proteins should have similarities and differences in their binding mechanisms to collagen. This will be beneficial towards treating certain pathologies that affect collagen binding proteins in the extracellular matrix.

*Poster 18*

### ***Molecular Analysis of a Paternally Transmitted Placental Phenotype in a Mouse Model of Paternal Alcohol Exposure***

**Ashley Driscoll**

*Faculty Advisor: Dr. Michael Golding*

I am investigating the reason why the placentas of mice sired by males exposed to alcohol prior to conception are larger than placentas of control mice. This research question is important because it will help explain how preconception paternal alcohol exposure influences the health and development of offspring, including symptoms such as low birth weight and metabolic irregularities. The knowledge gained from answering this research question can bring us one step closer to understanding the implications of preconception paternal alcohol exposure in people and ideally will eventually lead to changes that will benefit the health and development of the next generation. Research in the Golding lab has demonstrated that preconception paternal alcohol exposure is associated with a reduction in placental efficiency, however, the mechanism behind the enlargement of the placenta and reduction in placental efficiency is still unknown. In this project, I will utilize RNA-Seq analysis of placental samples in order to identify differentially expressed genes that are hypothesized to be involved with the observed placental phenotype. I will use RT-qPCR to analyze the expression of these genes. I will analyze the data collected via RT-qPCR to draw conclusions about the cellular mechanisms involved with the observed placental phenotype. We anticipate that genes regulating the cell cycle will be overexpressed in the enlarged placentas.

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Poster 19

## *Generation of Novel Genetic Resources in the Model Organism Tribolium Castaneum*

**Mayra Gonzalez**

*Faculty Advisor: Dr. Heath Blackmon*

The stored product pest, the red flour beetle (*Tribolium castaneum*), has emerged as a novel and powerful model organism over the last decade. Because these are stored product pest, the lab environment is similar to field conditions and, therefore, there is a minimized loss of genetic variation as the beetle strains adapt to lab conditions. Additionally, this species is an important pest with extensive impacts on US and worldwide agriculture. There is an extensive collection of mutant strains made from lab populations, but we lack a community genetic resource that consists of wild populations. The goal of my research is to identify phenotypically visible mutations linked to specific chromosomes and introgress these into the genome of wild-type populations. After introgression, I will quantify the efficiency of the introgression through whole-genome sequencing. The genomic resources developed in this project will be publicly available and may lead to species-species methods of pest control.

Poster 20

## *Evaluation of Derivative Security Attractiveness through Simulation of Future Information Conditions*

**Andrew Nakos**

*Faculty Advisor: Dr. Madhav Erraguntla*

Options are a type of security which rely on the performance of an underlying asset, and are priced based on the current information state. By simulating the future information state and comparing it with the current information state, a profile of return likelihood is deduced for each option quote.

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## Posters 21-30

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Poster 21

### *On the Efficacy of Ancient Egyptian Surgical Techniques*

**David Dishman**

*Faculty Advisor: Dr. Shelley Wachsmann*

There is not an abundance of evidence of medical treatments from the Old, Middle, and New Kingdoms of Pharaonic Egypt (i.e. 2686-1070 BCE), but there are some existing papyri written during that time period that contain instructions for ancient surgeons on how to treat injured patients who come to them. The most well-known of these is the Edwin Smith Papyrus, which documents 48 different types of injuries and how the surgeon should respond to each. Using translations of the papyri and books written on interpreting them, this project will build on existing research declaring the treatments' efficacy to instead determine the doctors' ability to treat a large proportion of the injuries they encountered. This project will look at the Edwin Smith Papyrus and other papyri that contain treatments for injuries and will determine whether the treatments listed would have helped the patient or not, either by being neutral or being actively harmful. Then that ratio of effective to ineffective treatments will be compared to a corresponding ratio of modern practices for treating the injuries described. Using a Chi-Squared Test to analyze these ratios will determine whether there is a statistically significant difference between the ratio of helpful to unhelpful treatments known to be taught to ancient Egyptian surgeons and treatments performed by modern surgeons. If there is no such difference, then it must be concluded that ancient surgeons were effective at treating injuries they encountered in a similar proportion to doctors today based on what we know about ancient treatments and the Egyptians should be acknowledged for that fact.

Poster 22

### *InNervate VR*

**Carter Lehman**

*Faculty Advisor: Dr. Jinsil Seo*

The question InNervate VR is seeking to answer is how do we enhance student's learning experience for nerve innervation in a human arm? Our proposal is to create a Virtual Reality (VR) experience that allows the user to interact with a human arm in order to better study the relationship between nerves and muscles in that area. The normal method for instructing students on human anatomy and innervation relies upon graphic illustrations or descriptions in textbooks, lectures from a medical professional, and dissection of human cadavers. However, while these methods may be effective means of instruction, as technology continues to evolve so does the opportunity for new methods of instruction that may be more effective. We will analyze the results from previous research projects done on using AR and VR to instruct students on medical anatomy, and create a new and improved version focusing on a human arm with the goal of enhancing the student's learning experience and overall

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comprehension. We believe that allowing students to have dynamic interaction with a digital reconstruction of a human arm will drastically improve understanding of this complex structure compared to solely relying upon printed textbook images and descriptions or dissections of fresh cadavers.

*Poster 23*

### ***Characterization of the BMP2-Specific Regeneration Window in the Adult Mouse Middle Phalanx Model of Induced Bone Regeneration***

**Stacy Nunez, Dania Muhammad, and Patrick Hall**

*Faculty Advisor: Dr. Lindsay Dawson*

In mammals, regeneration capabilities are amputation-level-dependent; amputations of the terminal phalanx (P3) undergo regeneration mediated by a blastema, while amputations transecting proximal levels of the digit fail to regenerate, resulting in bone truncation at the amputation plane and soft tissue scar formation. Therefore, what distinguishes extremity regeneration from scar formation is the blastema, a transient population of proliferating cells that undergo differentiation and patterning to regenerate the missing structures. The adjacent bone, the middle phalanx (P2), is non-regenerative. P2 can be induced to regenerate after treatment with Bone Morphogenetic Protein 2 (BMP2), however, the regeneration response is dependent on the timeframe in which BMP2 is applied. This timeframe is called the Regeneration Window (RW). Utilizing adult mice, our objective was to determine what creates a pro-regenerative wound environment that triggers extremity regeneration. Using immunohistochemistry, we compared the P2 RW at 9 days post amputation (9DPA), and the P2 timeframe when the RW is closed (24DPA), with the known characteristics of the P3 blastema. We report that both the P3 blastema and the 9DPA P2 wound site share regeneration characteristics such as an absence of vasculature, robust proliferation, and the presence of progenitor cells. Conversely, 24DPA P2 is characterized by the presence of vasculature, minor proliferation, and the maturation of progenitor cells. Thus, the P3 blastema and the 9DPA P2 share the presence of progenitor cells that pattern the final structure; however, while P3 progenitors are localized distal to the amputation plane and therefore result in patterned regeneration, the P2 progenitors, in contrast, are circumferentially located.

*Poster 24*

### ***Voter Support for Transgender Candidates: How Policy Platforms Affect Voter Support***

**Cassidy Hale**

*Faculty Advisor: Dr. Erik Peterson*

Voter support of transgender candidates is a very important sign to see the level of support for transgender people. This support is important because it goes against the negative perspectives that

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many people have for transgender individuals. However, a transgender candidate does signal certain things to voters. When voters are cued that a candidate is transgender, they view them as more liberal and possibly believe that they are less likely to represent the issues that are important to the voter (Jones and Brewer 2019: 698). Some voters will even change their vote to the opposing party if their party of preference puts forward a transgender candidate for election (Jones et al. 2018: 265). Lastly, some find that the political office that is being contested does not affect voter support. The level of support for transgender candidates is constant no matter is the political office they are running for is local, state, or national (Haider-Markel et al. 2017: 410). In order to test whether all of these aspects are constant with respondents, more test is needed. Transgender candidates have fought for the rights that they have and are now fighting to be included in the policy making process by running as candidates in political races. These candidates employ different strategies in order to be elected; therefore, transgender candidates have the best chance of being elected when they run using bi-partisan issues compared to a transgender or state-level policy issue.

Poster 25

## *Tick-Borne Pathogen Prevalence in Puerto Rican Livestock*

**Payton Blackburn**

*Faculty Advisor: Dr. Maria Esteve-Gasent*

Tick-borne pathogens (TBPs) are a significant source of health and economic burden in the Puerto Rican livestock industry. Unfortunately, despite two attempts at tick eradication programs, several species of ticks capable of transmitting pathogens remain widespread across the island. Additionally, changes in climate have been known to disrupt tick distribution and the prevalence of TBPs. This project seeks to evaluate the prevalence and distribution of various TBPs in ticks sampled from Puerto Rican livestock, post-Hurricane Maria in 2018. To accomplish this goal, our team collaborated with USDA APHIS officials in Puerto Rico. To this end, USDA-APHIS veterinarians collected samples from livestock (cattle and horses) from different premises across Puerto Rico. Samples were submitted to our laboratory and were screened for pathogens using both conventional PCR and real-time quantitative PCR. Currently, in the cattle samples tested we have detected a high prevalence (78.9%) of *Anaplasma marginale*, the causative agent of bovine anaplasmosis as well as the hemoparasites *Babesia bovis* and *Babesia bigemina* (overall *Babesia sp.* 23.7%). In addition, sequencing data reveal the presence of *A. platys* like organisms in 7.9% of the tested cattle samples. Furthermore, piroplasmas as well as rickettsial pathogens were detected in horses at very low prevalence (1.2% and 2.4% respectively). The results of this study will inform stakeholders of the TBP diversity affecting Puerto Rico livestock, as well as the distribution of those pathogens throughout the island. This information will be useful in future programs focused on effective eradication and management of TBP transmitting ticks.

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Poster 26

## ***Polyphosphate Affects Characteristics of Development in Dictyostelium discoideum***

**Louis Anthony Cadena**

Faculty Advisor: Dr. Richard Gomer

Polyphosphate (polyP) is a molecule ubiquitous throughout all domains of life that has a wide variety of physiological roles. It is especially prevalent in bacteria, where it modulates stress responses, survival, quorum sensing and pathogenicity. Some pathogenic bacteria such as *Burkholderia psuedomalli* and *Mycobacterium tuberculosis* with the reduced expression of polyphosphate kinase gene display a severe decline in virulence. In eukaryotes, PolyP is found in the nucleus and mitochondria, and has been shown to modulate blood clotting, fermentation activity, and bone remodeling. The social amoeba *Dictyostelium discoideum* produces extracellular polyP to regulate cell density by inhibiting proliferation, and to prime cells for development and sporulation. Recent work has shown that addition of extracellular polyP to vegetative *D. discoideum* increases the survival of phagocytized *Escherichia coli* and *Mycobacterium smegmatis* bacteria. To characterize polyP's effect on *D. discoideum* development, wild type *D. discoideum* were grown on agar plates with lawn of *E. coli*, and *Dictyostelium* cells were allowed to develop. In the presence of polyP, *D. discoideum* cells showed reduced clearance of *E. coli* bacteria on agar and showed delayed development. However, polyP increased the size of the fruiting bodies produced by *Dictyostelium*, while increasing bacterial retention within fruiting bodies. Similar phenotypes in *D. discoideum* development have been reported when *Dictyostelium* cells were grown on agar plates with lawn of 'farming' *Burkholderia agricolaris*, which are not killed by *Dictyostelium* cells when ingested, possibly due to polyphosphate secreted by *Burkholderia* bacteria. We will investigate the role of polyP in survival of 'farming' *Burkholderia* bacteria in *Dictyostelium*.

Poster 27

## ***Investigating Control Strategies for Hazard Mitigation of Coupled Buildings***

**Sheyenne Davis**

Faculty Advisor: Dr. Luciana Barroso

Various control strategies for the hazard mitigation of coupled buildings during earthquakes are investigated. More specifically, the optimization of actuator location and the impact of sensor damage and malfunction in semi-active devices is studied. Previous research has been done on which control strategies work best for coupled buildings during earthquakes, but there hasn't been anything definitive on an optimal actuator location or what a damaged sensor will do. The foreseeable outcomes of this research are to determine both the optimal actuator location and the effect of sensor malfunction on structural control performance. Being able to optimize the actuator location will allow systems to run more efficiently while information on sensor damage will allow engineers to make these systems safer. As these systems become more efficient and safer, the use of semi-active devices for structural motion control of coupled buildings becomes more pragmatic.



## *The Incorporation of Boronophenylalanine into Phage Display for Testing Ligand Capabilities with CD44: Quantifying Incorporation of the Boronophenylalanine in sfGFP-Top 10 Cells Transformants*

**Demonta Devone Coleman**

*Faculty Advisor: Dr. Wenshe Coleman*

CD44 is a glycoprotein transmembrane receptor, and its overexpression on stem cells is associated with various cancer types. Increased survival and proliferation of cells expressing CD44 involves ligand-binding induction, so if a ligand could be identified, drug discovery efforts could be strengthened. Boronophenylalanine (BPA), a noncanonical amino acid (ncAA) is of interest because of boronic acid's novel chemical properties with polyhydroxylated compounds. Phage display will be the experimental tool for studying ligand capabilities of BPA with CD44. The integrity of pEVOL-BoFRS-8, the plasmid encoding for BPA-tRNA synthetase and its particular tRNA with TAG codon specificity, needed to be evaluated before phage production. sfGFP-TAG cells were made chemically competent before being transformed with pEVOL-BoFRS-8. The resulting transformant broth culture was split in half and labeled the control and experimental; both contained arabinose, but only the experimental contained BPA. The cultures were incubated overnight at 37°C. The cells of each tube were pelleted and lysed; the supernatant of each was isolated in order to quantify GFP expression. Fluorescence was quantified using relative fluorescence units (RFU); the average fluorescence of the experimental and control cultures was 7750 and 1043 RFUs respectively. The results suggest that pEVOL-BoFRS-8 successfully facilitated the incorporation of BPA in GFP as seen through the higher fluorescence in the experimental group compared to the control. The phage display project is still underway, but these preliminary results show that pEVOL-BoFRS-8 plasmid is able to incorporate BPA in proteins encoded by genes containing the amber codon TAG such as gene III of ncAA displaying phages.

## *Image-Based Classification of Plant Disease*

**Srishti Kumar**

*Faculty Advisor: Dr. Xiaoning Qian*

Deep learning with convolutional neural networks (CNNs) has become increasingly successful in plant disease diagnosis, and consequently offers new promise in the ongoing battle against crop disease. While many studies continue to demonstrate its continued success in plant disease diagnosis, the complexity of the CNN architecture remains largely unexplored. My research aims to shed more light onto the architecture of the CNN, ensuring its reliability and authenticity by human intervention. These results can then be utilized to further improve the prediction accuracy of deep models by optimizing the underlying architecture. Three different models will be trained and tested on the PlantVillage dataset: InceptionV3, AlexNet, and GoogLeNet. To improve the CNN model, several visualization techniques (feature visualization, attention maps) will be applied to the model. These visualizations will help to uncover the CNN "black box", and shed light on features learned by the CNN.

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Poster 30

## ***Hand Recognition and Body Language Recognition Using YOLO***

**Aashish Ananthanarayan**

Explorations Editorial Board Member

*Faculty Advisor: Dr. Anxiao Jiang*

Neural Networks play an important role in real-time object detection. Several types of networks are being developed in order to perform such detections at a faster pace. One such neural network that can prove useful is the YOLO network. Built to perform real-time detection, YOLO offers great speeds for simple detections. The goal of our research is to see how YOLO would work with body language. Would it be fast enough? And how accurate would it be? Compared to other forms of object detection, body-language detection is more vague. There are several factors to be accounted for. This is why we first begin by talking about hand recognition and gesture recognition, and then move onto body language. This research aims at understanding how YOLO would perform when subject to several tests, and how successful it would be in recognizing different forms of body language.

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## **Posters 31-40**

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Poster 31

## ***Architectural Modernism at Texas A&M Campus***

**Marie Antoinette Chapa**

LAUNCH-Department of Architecture Undergraduate Summer Scholar

*Faculty Advisor: Dr. Priya Jain*

This project proposes to create a digital database of modern-era buildings on the TAMU campus of buildings built between the 1930s through the 1970s. This would allow a deeper appreciation of these less understood modern-era buildings that have not been as in-depth analyzed and studied as some of the older buildings from the campus. The research builds upon past research done in the field, because there have already been archives created of general information of the construction and technical aspects of the modern-era buildings. Past written works about buildings on campus focus on the construction and general history of some buildings at the Texas A&M University campus. However, this project plans to add new layers of meaning to this existing information, in order to create a collective digital database consisting of architectural, historical and cultural significance of modern-era buildings on campus. The results of this will be a searchable inventory with general information on each building, including dates of construction, architect, builder, and construction methods, among others. A series of campus maps will also be produced to depict the chronological evolution and construction of the buildings. The expected outcome of the research project is to select three campus buildings from the

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modern-era and create an even more in-depth analysis. This will consist of locating, digitizing and summarizing the original construction documents from Cushing Memorial Library. It will also include drawings, photographs, building contract files, and other relevant information about them that will help add to the understanding of their historical and cultural context and significance.

*Poster 32*

### ***Dimpler Detection Using Facial Landmarks in Videos***

**Shuaifang Wang**

*Faculty Advisor: Dr. Anxiao Jiang*

Dimpler is one of the body languages that contributes to the emotion contempt when the action appears unilaterally, and to boredom. The dimpler muscle pulls the lip corners to the side and creates a dimple in the cheek. The present study developed a dimpler detection model using 2D facial landmarks. Cheek and lip landmark were detected from each frame of the video using the Face-Alignment facial landmark detector. Features such as horizontal lip distance, vertical lip distance and lip ratio served as inputs to a linear Support Vector Machine (SVM). The SVM approach achieved a performance of 82.37%. The results suggest that horizontal lip distance, vertical lip distance and lip ratio are useful features for the detection of dimpler in videos.

*Poster 33*

### ***First Year Eats: A Look at Academic Retention and Excellence Outcomes***

**Alex Peters**

*Faculty Advisor: Dr. Alan Dabney*

While the positive impact of Learning Communities on the lives of freshmen students has been well established, there is always work to be done when a new Learning Community is implemented on campus. First Year Eats is one such community; 2019 marks the first year of a project that intends to help freshmen develop cooking skills and healthy eating habits, and provides them the resources necessary to do so from the comfort of their dorms. We are particularly interested in whether this program has a positive effect on retention rate and GPR for the students involved, relative to students in other Learning Communities. The students placed in this program are a subset of those projected to run out of money for food before the semester's end, so we hope to show that the implementation of First Year Eats helps alleviate the academic effects of food insecurity, and that this program is a viable path to ensuring that all students have the resources necessary for their success here at Texas A&M.

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Poster 34

## *Designing and Testing a Quench Heater for a 6T CIC Dipole*

**Michael Erickson**

*Faculty Advisor: Dr. Peter McIntyre*

The purpose of this project is to create and design a quench heater for the 6T Cable-in-Conduit (CIC) superconducting magnet. This magnet will be used to create stronger and more cost effective particle accelerators. The quench heater is a device that is designed to protect the magnet from an unexpected quench. In order to achieve this, the quench heater must be able to produce enough heat to heat the superconducting wires in the CIC cable to approximately 9K over the course of 10 ms. To design a quench heater in this way, it is required to find the dimensions needed using simulations. After finding the required dimensions, a CAD file was created so the design could be machined to the exact specifications. Then, using liquid helium and one cable, we tested if the heater would properly heat the cable. Thermocouple wires were integrated into the cable to measure the temperature of the wires during the experiment. This experiment has not yet been conducted and thus the results are still unknown. It is expected that the quench heater will be able to properly heat the cable over the 10 ms timeframe. If this experiment is successful, this design for a quench heater will be used for the 6T CIC cable.

Poster 35

## *Analysis of the Distribution of Monopsonic Subminimum Wage Rates*

**Irvin Claudio**

*Faculty Advisor: Dr. Jonathan Meer*

A monopsony firm market structure is one in which the firm is not a price-taker in the labor market, thus creating a market in which the supply curve is upward sloping. The marginal production and marginal cost of each individual firm are taken into account when hiring workers, and the federal and state governments use the summation to set a federal and state minimum wage, respectively. Thus, the minimum wage rate debate can have drastic implications on a multitude of economic variables. My research question asks whether subminimum wage rates are evenly distributed or "bunched", which will determine the market power that firms have over low-skilled labor. My research will analyze an implication of the minimum wage debate, the market power of firms over low-skilled workers, based on the distribution of subminimum wage rates.

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Poster 36

### *Digital Excavation of Osseous and Lithic Artifacts Embedded in Bone*

**Zachary Newell**

*Faculty Advisor: Dr. Michael Waters*

Micro computed tomography (micro-CT) and open source DICOM image processing software are used to create digital 3D models of prehistoric osseous and lithic artifacts embedded in bone. What appear to be osseous projectile tip fragments are embedded in the dorsal surface near the vertebral extremity of a 13,800-year-old mastodon rib from the Manis Mastodon site, Washington. Fragments of this embedded bone were digitally isolated using micro-CT data in 3D Slicer, through a process called segmentation. Because of the similar densities of the bone projectile fragments and the surrounding rib bone, the segmentation process is difficult, but possible with careful and thorough manual selection. The same process is used to reconstruct the tip of a suspected lithic projectile point, embedded in the skull of the late Pleistocene Alexon Bison, Florida. These studies demonstrate the utility of computer excavations and help us understand the limits of proboscidian-hunting by humans in North America.

Poster 37

### *How State Boredom and Habitual Boredom are Expressed Internally vs Behaviorally*

**Kristen Akin**

*Faculty Advisor: Dr. Heather Lench*

Boredom, as a subject in psychological research, is a drastically under-researched topic. Therefore, there is not much precedent for the subject researched in this study. This experiment researches a person's thoughts and behaviors while a person is in a bored state, how these thoughts and actions could be related to each other, and how habitual boredom could differ between people depending on these thoughts and actions. To answer this research question we observed and surveyed undergraduate college students in psychology classes through a between-subjects psychological research study. Two conditions were used; one that is a known video that induces a state of boredom and another that is the experimental condition of leaving participants in a room for twenty minutes by themselves. Two surveys were used in both conditions as well as a camera to observe the participants' actions and thoughts throughout the study.

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Poster 38

### *Particle Detector for Low Energy Heavy Ions*

**Karthik Rao**

*Faculty Advisor: Dr. Grigory Rogachev*

The purpose of this research is to build, calibrate and test a parallel-plate avalanche counter (PPAC) detector, which can be used to detect low energy heavy ion particles. This detector will enable Texas A&M to conduct experiments using heavy ions, which wasn't possible previously. This project builds upon previous research done using similar detectors used for high energy, light ion particles and is different based on the experiments it is being used for. The expected outcomes are that the detector can separate particles with equal magnetic rigidities, but different mass/charge ratios. It should be able to measure the time of flight for particles as they move from one end of the detector to the other. It should also be able to locate, with sufficient precision, the coordinates of the particle inside the detector so that the actual path which a particle takes can be found. This detector will then be used in nuclear astrophysics experiments using indirect methods. In particular, using the data from the detector, it will be possible to find the  $\alpha$ -ANC of the Neon ground state, which will be used to find the  $\alpha$ -ANC of Oxygen. This quantity can then be used to determine the rate of Carbon( $\alpha, \gamma$ )Oxygen reaction, which is one of the fundamental reactions in nuclear astrophysics.

Poster 39

### *Exploring the Role of the Nucleus Accumbens Core in Cocaine Satiety in Goal-Directed Versus Habitual Responding*

**Keland Moore**

*Faculty Advisor: Dr. Rachel Smith*

With this project we seek to understand the neural mechanism underlying the ability of an animal to self-titrate the amount of drug it intakes, even when given unlimited access. Previous studies have observed that trained rats will maintain a relatively stable level of responding for drugs and will adjust their pressing behavior to account for changes in dosage. This level of responding has been dubbed as the satiety threshold and has been hypothesized as a way to estimate the level of satiety an animal is experiencing during drug self-administration. Dopaminergic receptors in the nucleus accumbens core have been identified in playing a role in cocaine titration during self-administration. These findings suggest that cocaine-induced dopaminergic activity in the nucleus accumbens core is sufficient to drive cocaine satiety. In order to explore this mechanism further, we injected D1-type and D2-type agonists into the nucleus accumbens core of rats trained for cocaine self-administration immediately prior to an outcome devaluation. Our lab has developed a novel outcome devaluation method that allows us to differentiate between animals that are using a habitual or goal-directed neural system during cocaine self-administration. This method was used to identify changes in cocaine titration after agonizing both D1 and D2 receptors within the nucleus accumbens core. Documenting this neural mechanism and how

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it modulates drug taking behavior can provide further understanding for the mechanisms underlying addiction as a whole.

*Poster 40*

### ***Pavlovian Conditioned Flight Responses in Rats are Gated by Threatening Contexts***

**Isabella J. Huddleston**

*Faculty Advisor: Dr. Stephen Maren*

Animals use environmental cues to determine appropriate defensive responses. Understanding the mechanisms of context-mediated fear responses is crucial, as the dysregulation of these processes are central to trauma and stress-related disorders (such as anxiety or post-traumatic stress disorder). Decades of research establish how context mediates conditioned freezing in rats, but little literature has explained the mechanisms behind flight. To address this, we used a modified Pavlovian conditioning procedure in which the standard conditioned stimulus is replaced by a serial compound stimulus (SCS) comprised of a pure tone followed by white noise. Rodents display freezing to the tone and flight to the white noise in this paradigm, and flight is only observed in the conditioning context. Here, we conducted two experiments to investigate how flight responses are contextually gated. 1) Conditioned animals were placed into a novel context where one group of animals received unsignaled footshocks (Shock) and one group did not receive footshocks (No Shock). The next day both groups were returned to this context and underwent SCS-alone presentations. Animals that received unsignaled footshock displayed robust flight responses, whereas No-Shock animals did not. 2) Conditioned animals either underwent fear extinction of the conditioning context by exposing the rats to the context (Ext) or were exposed to a novel context (No Ext). The next day both groups underwent SCS-alone trials in the conditioning context. No-Ext rats still displayed robust flight responses to the SCS, whereas Ext animals did not. Collectively, these results demonstrate that context fear drives a high fear state, resulting in flight behavior from auditory and environmental fear.

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## **Posters 41-49**

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*Poster 41*

### ***Substitution of PPF into PCL-DA Network for Applications in Bone Regeneration***

**Emily Rayer**

*Faculty Advisor: Dr. Melissa Grunlan*

Semi-interpenetrating networks (semi-IPNs) prepared via incorporation of thermoplastic poly(L-lactic acid) (PLLA) in a cross-linked polycaprolactone diacrylate (PCL-DA) network were shown to have promising properties for applications in bone regeneration. Previous work was focused on fine-tuning properties such as degradation rate and mechanical strength of shape memory scaffolds for cranio-maxillofacial (CMF) bone defects. Poly(propylene fumarate) is an unsaturated polyester that has gained interest in bone tissue engineering and 3D printing because of high mechanical strength, controlled porosity, and a resorption timescale more closely matching bone than PCL. When substituted into a PCL-

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DA network, it is expected that PPF will improve resorption rates to better match bone neotissue formation while maintaining advantageous "self-fitting" or shape memory properties of the PCL-DA network, making it a good candidate for use in bone defects. After determining a working synthesis procedure for PPF, it will be substituted into a PCL-DA network. The PCL-DA/PPF network will then be made into films for characterization of critical scaffold properties (e.g. mechanical, shape memory, crystallinity, degradation, etc.).

*Poster 42*

### ***Optimal Mixing Weights Between Linear Blend Skinning and Dual Quaternion Skinning***

**Feras A. Khemakhem**

*Faculty Advisor: Dr. Shinjiro Sueda*

We propose to formulate a method of determining the optimal mixing weight between two vertex skinning algorithms. The vertex skinning algorithms in discussion are Linear Blend Skinning (LBS) and Dual Quaternion Skinning (DQS), each of which is not perfect if used in isolation. With this algorithm, a "deform factor" determines the linear combination with which LBS and DQS are employed to find a deformed mesh that is neither lacking in volume due to LBS, nor contains volume gain from DQS. Finding the best deform factor will allow for more plausible deformations, with respect to shape and volume of models. We will look for an efficient method to find the optimal factor value, which is important especially when many models are being skinned. This work extends the work by Yin [1], which was published in 2019, meaning this is still a very novel approach to skinning, without much other published material building off it yet. The expected outcome is that an automatic process to finding the optimal deform factor in two dimensions (2D) is constructed, and eventually in three dimensions (3D).

*Poster 43*

### ***Virtual Simulation of Robotic Operations Using Gaming Software***

**Eric Lloyd Robles**

*Faculty Advisor: Dr. Stavros Kalafatis*

The main objective of this research project is to perform robotic teleoperation using virtual reality (VR) as a platform. A game engine, such as Unity, is used to build a VR environment containing a virtual model of a robotic arm through which the movements of the actual robot arm are controlled in real-time. Furthermore, the implementation of VR teleoperation on robotic systems is useful for operating collaborative robots such that the operator can visualize an immersive, tridimensional view of the actual robot while controlling it remotely. This can help evaluate the compatibility and reliability of training collaborative robots entirely in VR to further enhance the use of human-robot collaboration in the industry. In the project, the VR teleoperation implementation will begin by building a virtual simulation of controlling the robotic arm in a game engine called Unity. To provide the simulation for the research,



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a CAD model of a robotic arm will be imported into Unity without any loss of data. Within Unity, the degrees of freedom of the virtual robotic arm will be added such that its movements have the same constraints as its actual design. An algorithm to control the robotic arm will be implemented using Unity tools and computer programming. To validate the simulation, the robotic arm will be assigned to perform a simple task such as a pick and place activity. The robot must be able to perform the task using a user interface such that an operator can manually direct the robot's movements. Afterward, skill acquisition capability will be tested by having the robotic arm complete the task autonomously.

Poster 44

## ***Polyphosphate Affects Essential Processes in Dictyostelium discoideum***

**Jacquelyn McCullough**

LAUNCH Undergraduate Research Ambassador

Faculty Advisor: Dr. Richard Gomer

Polyphosphate is an ancient molecule that is composed of up to hundreds of phosphate residues linked by high energy phosphoanhydride bonds and found in all kingdoms of life. Understanding the roles of polyphosphate in biological systems is especially important to human medicine because it has thus far been identified as a key regulatory molecule in both human cells and in many of the world's most prominent pathogens. In these experiments, I sought to determine how polyphosphate regulates important processes in the model organism *Dictyostelium discoideum* through assaying pseudopod production, mitochondrial size and mass, oxygen consumption, glucose and ATP levels, and cellular protein content. *Dictyostelium* is an invaluable tool for polyphosphate research because it is one of the only eukaryotes to possess a homolog of the polyphosphate kinase gene that is found in most prokaryotes. The experiments yielded several valuable findings. Physiological levels of polyphosphate decreased the quantity of pseudopods produced by *Dictyostelium* cells and increased the average pseudopod lifespan. Additionally, fluorescence quantification demonstrated that mitochondrial size and mass increase disproportionately to the accompanying increase in cell size after 24 hours of exposure to polyphosphate. Treatment with polyphosphate also appeared to slightly increase cellular ATP levels and protein content in *Dictyostelium*. These results indicate that polyphosphate may interact with mitochondria in order to influence metabolism and other essential cellular processes in *Dictyostelium*. Further experimentation will focus on varying the experimental concentrations of polyphosphate in order to determine thresholds and assaying polyphosphate's effect on extracellular acidification as an indicator of glycolysis regulation.

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Poster 45

## ***Subject and Style Aware Image Recommendation using Cluster Analysis***

**Sagar J. Patel**

*Faculty Advisor: Dr. James Caverlee*

Since the rise of social media in our present age, the number of images a user must sort through to find an image that matches his preferences has become more and more unmanageable. However, with a recommender system that curates the images based on the subject and the aesthetic style, the user can find the image he's looking for without having to go through the images that don't match his preferred style. The multi-faceted problem of recommending images has been extensively studied, incorporating various information like location, time, user behavior and even tags to improve accuracy. Our contribution to this problem will instead focus on improving subject-based clustering and incorporating style preferences, which, to our best knowledge, have yet to be explicitly applied in this setting. We explicitly use style elements to more closely model the very human preferences we have for image styles—not just image subjects. We assume that even if somewhat influenced by the subject of the image, the aesthetics preferences of a user are mostly consistent across subjects and use this assumption to learn the multi modal aesthetic preferences of a user.

Poster 46

## ***Linkage Based Growth: An Analysis of the Determinants of Leontief Multiplier Size***

**Jose Israel Morales, Madison Poe, and Rachel White**

*Faculty Advisor: Dr. Samuel Cohn*

Traditional developmental economics gives primary emphasis to the creation of base industries, such as automobile manufacture or high tech sectors. The present research follows Hirschman in emphasizing the size of the linkage from base industries to other sectors of the economy rather than the size of the base industries themselves. Economic multipliers are a measure of how large or small the linkages of an economy are. This study aims to identify what factors influence multiplier sizes which lead to bigger rather than smaller linkages. Bigger linkages result in greater economic growth; therefore, understanding what factors are correlated with bigger linkages has the potential to positively influence economic policy. Our goal is to shape the way economic policy is currently carried out by taking into account the factors that determine high and low multipliers. We consider GDP per capita, percent of GDP that comes from manufacturing, education level, and income inequality as possible factors that influence multiplier (linkage) sizes. An OLS regression analysis, taking the form of  $Y = a + b_1 * G + b_2 * M + b_3 * E + b_4 * I + e$ , will be used to analyze the relationship between multiplier size and the independent variables. We expect to find that higher GDP per capita, percent of GDP in manufacturing, and education levels will result in bigger linkages, while higher income inequality will result in smaller linkages.

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Poster 47

## ***A Study of the Relationship between Psychopathology, Chronotype, and Preterm Birth***

**Joslyn Cavitt**

*Faculty Advisor: Dr. Gerianne Alexander*

In recent years, a growing number of researchers have taken an interest in the relationship between psychopathology, preterm birth, and sleep. However, few studies have investigated this relationship in populations at risk for both internalizing (e.g., depression, anxiety, etc.) and externalizing (e.g., substance abuse, antisocial personality, etc.) disorders. This secondary data analysis aims to address this deficit of knowledge and to examine the relationship of chronotype, or an individual's propensity to sleep and wake at particular times, with internalizing and externalizing disorder-linked traits in emerging adults that were born preterm. Each component of this relationship will be assessed using multiple metrics, including objective evaluations such as eyetracking (an established measure of impulsivity and risk-taking) and biometric monitoring of rest/activity cycles (i.e., actigraphy) as well as subjective, self-reported evaluations of sleep (i.e., Pittsburgh Sleep Quality Index), birth status, and behavioral traits. Additionally, given evidence of gender-related differences in psychopathology as well as in chronotype, the study seeks to investigate whether this relationship varies according to gender. Possible findings could have implications in better understanding the relationship between chronotype and psychopathology in a vulnerable population of young adults.

Poster 48

## ***The Effect of Cadmium on Chicken Embryo Heart Development***

**Nicole DePadova and Mahi Basra**

*Faculty Advisor: Dr. Linglin Xie*

This study aims to elucidate the effect of cadmium (Cd) on chicken embryo heart development. Cd is a hazardous chemical found commonly in cigarette smoke and in food sources due to environmental contaminants. Cd is known to bioaccumulate in organ tissues to cause carcinogenic effects. Our study investigates the effect of Cd exposure during early gestation on embryonic heart development. Phenotypic results show an increasingly hyperplastic myocardial wall associated with increasing CdCl<sub>2</sub> dosage and earlier exposure. This semester, we will be using staining through apoptotic markers to determine the mechanism of transport of zinc and cadmium through the embryo. Biochemical analyses and assays will be conducted to further inquire the biological and molecular processes that result in the observed phenotypic changes associated with CdCl<sub>2</sub> exposure. We hope to elucidate the mechanism of Cd cardiotoxicity in embryonic development to contribute to identifying susceptibility and treatments for Cd exposure in utero.

## *Dance Movement Visualization and Education in Virtual Reality*

**Carmen Sims**

*Faculty Advisor: Dr. Jinsil Seo*

How can virtual reality be used to advance modern dance education methods? As a rapidly evolving technology, virtual reality has the potential to be developed for many different educational purposes. Previous research has shown that using motion tracking and virtual reality to learn dancing is plausible, however the programs previously developed are lacking in user interaction and learning advancements. Our project will build upon these fundamentals. We will capture dance movements from a couple of dancers and incorporate the capture data to a virtual dance avatar's movements. Students can learn about key dance movements by viewing and interacting with the avatar's dance movements in the virtual reality environment. The user will be able to observe the dance movement at any point in the routine, with the ability to slow down the dance in order to observe certain movements at a more comprehensible speed. In addition, this application will provide two views of the dance avatar; one as the physical character, the other as an anatomical model of the character's musculoskeletal system. Therefore students can learn detailed muscle movements when the avatar dances. We will include three movements specifically the Arabesque, Second port de bras, and Retire from modern dance compositions, in the VR application. We chose these performances because of the common issues with misalignment of the body in these movements and the complex muscle/bone systems at play. Often students have difficulties performing or maintaining these positions correctly because of several reasons: muscular weakness, inability to identify and engage the correct muscle groups, and structural abnormalities. This virtual reality program will allow the user to observe a 3D avatar performing a dance within the virtual world-space. The user will have different interactions they can perform in the program, such as visual feedback preferences for the avatar that will allow them to understand the dance in a more enhanced environment, as well as learn at their own pace. This will allow for greater user interactions, such as being able to rotate and view the performing avatar from different angles within a 3D world-space, along with the ability to playback the virtual performance and observe the dance at different rates of speed. Creating the ability to perform these interactions in virtual reality will allow us to add additional user interactions in the future, like virtual tutor feedback and visual correction feedback as previous projects have done. In addition to these interactions, our program will take user inputs from a virtual reality headset and trackers, such as those from HTC for their VIVE headset. The VIVE has the flexibility of having programmable user body trackers, which are much more affordable than a full-body motion capture suit. Furthermore, the ability to change the amount of body trackers used allows for the flexibility of adjusting tracking precision, based on usability and ease of evaluation. With this advancement of technology available for research purposes, as well as demonstration of previous successful techniques, the resources are available for the creation of a user-friendly, virtual reality-based modern dance education program.





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