BU | Arvind & Chandan Nandlal Kilachand Honors College

Together Again: United By Exploration

The 9th Annual
Keystone Symposium

Saturday, April 30th
9:00am - 6:00pm
100 Bay State Road

Welcome to the 9th Annual Kilachand Honors College Keystone Symposium. We are excited to spend the day sharing our projects with you.

MORNING SCHEDULE

9:00 AM **OPENING REMARKS**

9:15   **Poster Introductions**

Room 545	Room 613A
Abby Gross	F. Vanessa Alvarenga
Audrey Hager	Isabella Baker-Villareal
Matt Kim	Hannah Collins
Katie Lee	Maggie Chou
Gabriela Morgan Longo	Jack Giunta
Deep Patel	Sarah Ju
Leanna Reynolds	Audrey McMillion & Sushane Sharma
Jackson Wallace	Ji Zhang

9:40   **Poster Presentation and Discussion**

	Room 545	Room 613A	Room 613B
10:15	Yongyuan (Steve) Huang	Sydney Gerbel	Richard Boylan
10:30	Christian Parades	Morgan Haas Donohue	Emily Oros & Meghan Howard
10:45	Lauren K. Hagy	Caitlyn Leonard	Lincoln Alex MacVeagh
11:00	Sophia Alvarado	Katie Barnes	Andy Vo
11:15	Rana Hussein	Joel Herbert	Gabby Ostoyich
11:30	Riki Stout	Aidan Kaminer	Peter Siegel
11:45	Sheena Patel	Khoa Tran	Young Ye

12:00 PM **LUNCH**

AFTERNOON SCHEDULE

	Room 545	Room 613A	Room 613B
1:00	Trey Moore	Amanda Katchmar	Aash Mukerji
1:15	Victor Cadaoas	Katie Greene	Isabel Moring
1:30	Catherine Devlin	Cameron Helman	Sam Krasnoff
1:45	Zach Bodi	Anna Natrakul	Reva Bardhi
2:00	Maelee Chen	Jackson Moore-Otto	Liam Ward
2:15	Zora Che	Trevor Melsheimer & Gayatri Sundar Rajan	Jessica Morse
2:30	Victoria Zdanowicz	Grace Johnson	Macy Wilbur
2:45	Andrew Reilly	Emma Grace Cowan	Luisa Mesa Uruena
3:00	Sebastian Porreca	Carolina Becerril	Amos Mwaura
3:15	Sawan Patel	Trevor Tamura	Emily Lyons
3:30	Briana Morgan	Mira Dhakal	Jessica Man
3:45	Russell Laman	Stephanie Anakwe	Ben Braun
4:00	Adi Jahic	Rona Moriah	Nicole Kwon
4:15	Sheila Jimenez Morejon	Marla Hiller	Shanshan (Susan) Cao
4:30	Clarence Perez-Meija	Alex Blumenfeld	Alex Floru
4:45	Cristina Rivera	Brian Jung	Jerica Xu
5:00	John Lei	Sam Macriss	Izzie Collier
5:15	Susritha Kopparapu	Megan Wong	Kelsey Brown
5:30	Katie Sena	Selina Li	Lexia Cicone
5:45	Marissa Carty	Jessica Weber	Waleed Khan

Prosecuting White Power: How White Identity Influences the United States Judicial System

Sophia Alvarado

Advised by Jeremy Menchik, Associate Professor of International Relations, Pardee

In the past twenty years, scholars have found that whiteness and white supremacy are entrenched in American institutions. This paper investigates how white identity has impacted the American judicial response to white power violence. How has white identity been institutionalized in the United States? How does the judicial system treat black power actors and white power actors differently? Drawing comparisons between the prosecution of the white power and black power movements, I argue that racial identity obscures the judicial response to violence perpetrated by white actors versus violence perpetrated by black actors. Through a comparative historical analysis of 109 white and black power movement members and the judicial treatment of crimes (84 total), I found that white power actors were not sentenced to life as often as black power actors, were less often killed extra-judicially by the police, and more frequently acquitted of their crimes. This study quantitatively demonstrates how countermeasures for white supremacy have demonstrated bias in the U.S. judicial system and contributes to the body of literature regarding the institutionalization of white power, while concluding that the U.S. judicial system is skewed towards white supremacy in the United States.

Perceived Discriminatory Behavior Committed by Medical Professionals and its effect on Postpartum Latinx Women

F. Vanessa Alvarenga

Advised by Emily Feinberg, Associate Professor of Pediatrics, MED; Associate Professor of Community Health Sciences, SPH

Societal norms romanticize pregnancy to be a beautiful journey for all women, but this is typically not the case. Studies have shown that post-partum women report symptoms of anxiety, which are often comorbid with symptoms of depression. In addition to the physical and emotional changes of accommodating a fetus, pregnancy also necessitates the presence of new medical professionals. However, some women find this to be a challenging experience, especially those who were born in a non-English speaking country. This holds true in the Latinx community, the largest non-white population in the United States. It is imperative that all patients are accommodated when they come in for checkups. They should feel comfortable to share their health concerns with a physician, even more so when they are pregnant. In order to understand how physicians interact with Latinx women, I conducted a secondary analysis of the Listening to Mothers in California study. In this analysis, I investigate the possibility of discriminatory behavior committed by medical professionals, and how this may have subsequent effects on Latinx women postpartum. My findings show that Latinx women reported higher rates of discriminatory behavior. However, non-Latinx women have a higher rate of experiencing anxiety and depressive symptoms compared to Latinx women.

613A

9:15

Quickening: A Comic Book Depicting the Clash of Worldviews Underlying the Abortion Debate

Stephanie Anakwe

Advised by Davida Pines, Associate Professor of Rhetoric, CGS

As Americans rallied to push for state level abortion bans in the 19th and early 20th century, other advocates publicly opposed those laws, culminating with the pivotal Roe V. Wade court case that legalized abortion in America. Each group in this dispute positioned themselves as defending human rights, positions they continue to hold in the present day. My project uses a comic book to vividly depict the different views and ethical standpoints on abortion. The ability of the comic medium to concisely communicate complex topics in a way that is accessible to a wide variety of readers makes it an apt choice for tackling this contentious and multifaceted subject. The stances portrayed include those from three people who were interviewed—two who are pro-choice and one who is pro-life—and a wide variety of texts written by authors from different nations spanning the spectrum of views on abortion. The product is Quickening which, through investigating each stance and its underlying assumptions, demonstrates that the contention over reproductive rights and the morality of abortion represents a clash of worldviews that appear irreconcilable, with people at each side holding a different presupposed idea of what rights are inviolable. A future goal springing from this project will be to lay out what the stakes are for each stance that was portrayed and where the arguments presented by each side ultimately lead.

613A

3:45

Social Comparison in the Age of Social Distancing: Effects of the COVID-19 Pandemic on Women's Body Image

Isabella Baker-Villarreal

Advised by Andrea Mercurio, Senior Lecturer in the Department of Psychological & Brain Sciences, CAS

"I wish I looked like that" is a thought many women have had, whether scrolling through Instagram or walking down Commonwealth Avenue. Extensive research shows that seemingly innocent social comparisons like these can be quite harmful, whether the comparison made is upward—"Their appearance is better than mine"—or downward—"Their appearance is worse than mine." Mental health has enjoyed a long-awaited spotlight during the COVID-19 pandemic, but there is limited research so far regarding the pandemic's effects on particular mental health issues, including body image concerns— the perceptions and feelings people have about their own bodies. This study explored women's views about their body and appearance, with particular attention to 1. The role social comparison plays in how women feel about their bodies/appearances and 2. How the COVID-19 pandemic may be negatively or positively affecting body-related attitudes and behaviors. Boston University undergraduate women were recruited via online platforms and in-class announcements for a 20-minute interview. These first-hand accounts were analyzed using a grounded theory approach to determine common themes around body and appearance satisfaction, body-related social comparisons with peers, and the influence of the pandemic on body image and eating.

613A

9:15

Felony Disenfranchisement in Virginia: How the Legislative Impact and Legal Precedent of Virginia's Constitution are Excluding the Formerly Incarcerated

Reva Bardhi

Advised by Brooke Williams, Associate Professor of the Practice of Computational Journalism, COM

Countries throughout the world and the United States have been disavowing felony disenfranchisement, the principle that a felon automatically loses his right to vote upon conviction. However, despite the calls for repeal and amendment, the Commonwealth of Virginia enshrines felony disenfranchisement in its constitution, remaining steadfast in maintaining this law due to its roots in the Enlightenment principle of civil death. Under this principle, a conviction means a person is considered dead in terms of lawful rights, effectively removing all privileges of remaining a citizen – including voting. This study follows the development of felony disenfranchisement in Virginia, exploring the federal legal precedent and the application of civil death in state's body of constitutional law. After examining the legal precedent, this study moves toward a quantitative analysis utilizing data from Virginia's Department of Elections annual reports. This study shows a substantial increase in felony disenfranchisement rates in recent federal elections. Subsequently, it analyzes the geographic distribution of disenfranchisement and reinstatement of voting rights, finding the counties with the highest rates of disenfranchisement are not the highest counties with the highest re-enfranchisement rates. Finally, it quantifies the effects of location to determine whether there is a statistically significant link between voter history and relative demographic makeup in the county. This study seeks to answer questions about whether or not the legislative impact of this constitutional clause is discriminatory in nature and explores the potential for voter suppression.

613B

1:45

Positivity for Which Bodies: Exploring Body Positivity and Fat Acceptance on TikTok

Katie Barnes

Advised by Cati Connell, Associate Professor of Sociology and Director of the Women's, Gender, and Sexuality Studies Program, CAS

Content related to body image is a major trend on the popular video sharing app, TikTok. Fat acceptance content, which is specifically geared towards increasing societal acceptance of fat people, often comes into conflict and conversation with body positivity content, which seeks to celebrate all bodies. TikTok creators that promote fat acceptance often criticize the body positivity movement on the app as lacking true diversity and abandoning the movement's original aim to analyze systems of oppression in order to focus on individual confidence. Furthermore, TikTok's algorithm has faced claims of bias. This research uses the method of algorithmic content analysis to investigate both movements and determine which discourses fat acceptance and body positivity creators engage in on TikTok, as well as which creators have the highest engagement on the platform. This project analyzes data from a sample of 10 body positivity and 10 fat acceptance creators, all of whom had more than 10,000 followers. I find that body positivity creators are more likely to frame the movement as being about individual insecurities and less likely to address systemic oppression, and that thinner, white creators have higher levels of engagement overall. This research highlights the experiences of TikTok creators that speak up about social issues, and reveals avenues for further research into the platform and both movements.

Social media use and eating disorder risk among college students

Carolina Becerril

Advised by Paula Quatromoni, Associate Professor of Nutrition, SAR

Social media has the potential to both misinform consumers on nutrition advice and present a risk to public health by exacerbating eating disorder risk factors. Our study explored the influence of social media use on three important outcomes: eating competence, body appreciation, and eating disorder risk. Participants were college students, age 18 or older, recruited from six Massachusetts universities who completed an online survey. Assessments included the Satter Eating Competence Inventory (ecSI2), the Body Appreciation Scale (BAS), the Eating Attitudes Test (EAT-26), and demographic questions. Among our sample of 334 who completed the survey, 161 (48%) used social media about 1 hr/day, 70 (21%) about 2 hrs/day, 49 (15%) about 3 hrs/day and 54 (16%) about 4 hrs/day or more. In our sample, 56% reported an eating disorder diagnosis and 72% expressed eating and/or body image concerns. Eating competence, an adaptive skill endorsed as a sign of reliable, flexible eating, among college students was low (21 ± 9) as was body appreciation (39 ± 9), while eating disorder risk was high (23 ± 13). Univariate and multivariate regression analyses were run with individual scores for each survey with social media use as the exposure. White students and first-generation students were more likely to have lower eating competence, lower body appreciation, and higher eating disorder risk among the demographic subgroups examined ($p < .05$). We found an inverse relationship between social media use and EAT-26 scores, suggesting that as social media use increased, eating disorder risk decreased. While this finding is counter to our hypothesis, this observation could be related to the very high burden of disordered eating and body image distress reported in our sample, impacted by a survey time period during COVID-19. In fact, a common practice for individuals undergoing treatment for eating disorders is to purge social media accounts and limit time spent online. These findings deserve more investigation. Qualitative research could explore more deeply how college students engage with social media to better understand what role social media plays in relation to eating disorder risk and body image dissatisfaction.

613A

3:00

Industry Concentration and Regional Business Cycles

Alex Blumenfeld

Advised by Yuhei Miyauchi, Associate Professor of Economics, CAS

A long tradition of economic thought, originating with Jane Jacobs, has argued that having a diverse industry mix is beneficial for a city's long-term economic health. In particular, previous research has established that cities with low "industry concentration" – which measures how much of a city's total employment is accounted for by its largest industries – have historically had higher GDP growth. This study extends that analysis by considering the effects of industry concentration on both growth trends and fluctuations in GDP. Using data at the Metropolitan Statistical Area level, I find a significant positive relationship between cities' levels of industry concentration and the magnitude of their fluctuations in GDP over the past two decades, along with a slightly negative relationship between concentration and GDP growth. A subsequent exercise aimed at controlling for city-level factors that influence economic growth results in a much weaker relationship between industry concentration and GDP fluctuations, which suggests that location-specific factors that influence industries' performance are important for determining the effects of regional industry diversity.

613A

4:30

Automated classification of sidewalk accessibility using machine learning

Zach Bodi

Advised by Wayne Snyder, Associate Professor of Computer Science, CAS

For wheelchair users and other individuals with mobility impairments, accessible city sidewalks are critical to safely going about their day-to-day lives. Yet, a short walk through Boston reveals seemingly endless flaws in many of its sidewalks that make them inaccessible, and there is no comprehensive data that currently exists showing which sidewalks are accessible. Without this data, wheelchair users are forced to jeopardize their safety by learning through trial-and-error which areas are accessible to them. Meanwhile, the City of Boston tracks which sidewalks need repairs via an antiquated 311 system that requires residents to report individual issues, leaving a majority of accessibility barriers unaddressed. Thus, wheelchair users would greatly benefit if there were an automated method by which the City of Boston could map sidewalk accessibility. In my project, I used a wheelchair fitted with a camera to collect 800,000 images of sidewalks in various locations around the city and labeled them according to surface type (e.g. concrete, brick, asphalt). Using that data, I built and trained a convolutional neural network that can classify the surface type of a sidewalk from a previously unseen image. This project provides a foundation by which the City of Boston could collect geolocated images of Boston sidewalks and then automatically classify the surface types of those sidewalks. Furthermore, the classifier could be used as a starting point for future classifiers, such as a model that identities surface damage, as the appearance of surface damage varies between surface types.

545

1:45

North to Alaska! An Intergenerational Road Trip Documentary

Richard Boylan

Advised by Johnathan Foltz Associate Professor of English/Cinema & Media Studies, CAS

"North to Alaska!" Less than five minutes after leaving our house my Dad was already shouting out these words, a battle cry to the hundreds of hours and thousands of miles that lie between us and our destination. The collective narrative of the American Road Trip is one that has been immortalized in popular culture. Arisen from stories of discovery and self-exploration on the open road interwoven with perfectly manicured cinematography that transforms all five regions of the U.S. into a vision of shining seas, amber waves of grain, and purple mountain majesties. A collective story of adventure primarily shaped by popular media, but also kept alive by personal experiences of travel. My Dad's story of his cross-country trip to Alaska at the age of 22, has awed me since childhood. Accompanied by an album brimming with yellowing photographs, the stories of his trip have surpassed reality to become legend. A familial oral tradition passed down between generations. In response, my project is a performative documentary, chronicling my Dad and I's attempt to recreate his cross-country trip to Alaska. In part, a chance to forge the next chapter of our familial story, but also a means to analyze the veracity of both his cherished memories and the larger national narrative of the American Road Trip. Across five weeks and more than ten thousand miles we lived on the road, traveling from Rhode Island to Alaska and back, to gain insight into both the collective and personal stories that have shaped our understanding of the American Road Trip while putting to record a contemporary narrative of our own.

613B

10:15

L.I.I.S: Lift and Installer for Incubator Subassemblies

Ben Braun

Advised by William Hauser, Associate Professor of the Practice of Mechanical Engineering, ENG

Manufacturing environments involving heavy machinery often contain inefficiencies and potential safety hazards. These issues apply to Rapid Micro Biosystems' process for the assembly and installation of components for their automated incubator system, a product used for testing microbial samples. A hydraulic scissor-lift cart is the current solution that handles the construction and installation of a critical subassembly, and it fails to fully meet core functional requirements. Namely, it does not support a necessary flipping operation. Sufficient stability mechanisms that constrain the motion of the cart and subassembly are absent, making the means of handling an industrial scale load of nearly 200 lbs non-ergonomic and possibly injurious to workers. While industrial suppliers offer many types of devices that can flip, lift, and install components, none are suited to the unique needs of the subassembly's specific touchpoints, delicate internal parts, and precise installation procedure. We designed a new mechanism with superior functional performance and added safety measures. We used the existing cart as the basis for modifications that provide enhanced safety features to improve stability. A conveyor system permits smooth installation at the required height, restricts unwanted motion, and allows for easier subassembly construction while fully supporting the load over its entire footprint, unlike the previous solution. A removable flipping system executes a controlled flipping operation with minimal manual input, removing the most potentially dangerous risk of harm from the assembly process. We conducted functionality tests on a prototype with scaled load capacity to prove the feasibility of our new mechanism. The test results and direct client feedback confirm the success of the new mechanism as safer and more effective. Materials enabling the future development of the prototype for full scale design implementation were also provided to the client.

613B

3:45

Boundary Work in Boston Party Subcultures

Kelsey Brown

Advised by Ashley Mears, Associate Professor of Sociology, CAS

University party culture is an incredibly salient topic: parties are places where students socialize and are socialized, and inequalities are reproduced. There has been extensive research on what is considered in most colleges to be the dominant party subculture, frats, and on more countercultural subcultures, such as DIY / house / punk shows. However, there is no research comparing the two, even though they are in many cases in the same area and have the same population: students. Using 30+ semi-structured interviews and ethnographic work, I compare and contrast fraternity and house party cultures in Allston, a Boston neighborhood known for college parties. My research explores how culture and inequality are reproduced in both contexts. I find that the two subcultures interact just enough to develop relational identities, but not enough that they recognize their similarities. In their process of identity formation, they imagine strong symbolic differences that they internalize. They also negotiate their identities in a way that I call "privilege bargaining", which hinders them in recognizing their own privileges. Combined, these negotiations lead to the two subcultures failing to recognize their striking similarities, and structural issues. By looking at the two cultures together, we get fresh insights into identity formation, privilege theory and subcultural studies.

613B

5:15

How Filipino Americans Have Claimed Their Identity Through Literature

Victor Cadaoas

Advised by Maurice Lee, Professor of English, CAS

Like many Filipino Americans, I have always found it hard to identify with other Asian groups or as an American. This is because of the Philippines' colonial roots; it is the only Asian country that was colonized by the United States. As a result, the Filipino American experience is a wholly unique one, where the group is not viewed like any other Asian minority or fully accepted as American. This ambiguous status has led writers and scholars to ask: how, if at all, does Filipino American identity differ from native Filipino identity. My paper exclusively examines how Filipino American authors have used their literature to communicate their Filipino American identity from colonialism to the present. Specifically, I read America is in the Heart (1946) by Carlos Bulosan, Dogeaters (1990) by Jessica Hagedorn, and The Son of Good Fortune (2020) by Lysley Tenorio to explore this question. I start at the Filipino American's genesis with Bulosan's work to the group's present conditions in Tenorio's novel; Hagedorn's book bridges group's initial to current identity. I investigate if these authors express an identity that aligns with Filipino colonialism or if they form one that is entirely distinctive. I found that these authors all discuss about a Filipino American culture that is founded on the pursuit of the American Dream, advocacy for the working class, and family dictates one's every decision. Ultimately, I analyzed this literature as a means to examine and place a stake in my own Filipino American identity.

The Aesthetic Experience of Mathematical Understanding

Shanshan (Susan) Cao

Advised by Michaela McSweeney, Assistant Professor of Philosophy, CAS

Mathematicians often judge certain proofs to be more beautiful or more "explanatory" than others. These evaluations have led philosophers to ask: what makes mathematics beautiful? What makes it explanatory? Finally, how are beauty and understanding related? Contemporary philosophers have approached these questions in different ways. Cain Todd uses the result of psychological studies to argue that aesthetic feelings (such as the feeling that something is beautiful) and epistemic feelings (such as the feeling of understanding) in mathematics both stem from the phenomenon of "cognitive fluency." Angela Breitenbach uses a Kantian notion of aesthetics to locate the source of mathematical beauty in a "sensed harmony" between our intuition and mathematical concepts. Marc Lange takes an externalist approach to argue that what makes certain proofs "explanatory" (and beautiful) is their ability to trace special structural features of a theorem all the way back to the proof's setup. Unfortunately, none of these theories quite capture how I experience mathematics and how I see other mathematicians engage with the subject. In my paper, I propose a new account of mathematical understanding and its relationship to beauty that more accurately tracks the way I see mathematicians engaging with math. I argue that to understand mathematics is to grasp a set of connections between mathematical objects in a cohesive way such that they appear to us as belonging to (and expressive of) a single underlying structure. This experience shares many of the paradigmatic qualities of aesthetic experiences, such as being non-instrumentally valued and directly perceived. Due to these qualities, the pursuit of this experience guides the evaluation of existing mathematical writing and motivates the study of mathematics itself.

613B

4:15

Somewhere Among the Wildflowers: Poetry on the Psychology of Well-being

Marissa Carty

Advised by Carrie Bennett, Master Lecturer of Writing, CAS; Jessica Bozek, Senior Lecturer of Writing, CAS

Metaphor, melody, and humanity can improve your well-being.

Science provides many of the ingredients we need to live a good life, but they are rarely communicated effectively. When scientific findings are presented to a large audience, it is often in the form of a statistic or jargon-filled report. However, art informs us powerfully. Poetry opens our imagination and forces us to apply our personal experiences to its stanzas to understand it. This introspection allows poetry to dive directly into our hearts in ways that can change our deepest beliefs.

As reliable and valid as research is, the rigor and rules of the scientific method limit who, what, when, how, and where researchers can study. Art fills in the gaps to support experimental findings. Science already uses metaphor as an explanatory tool. Poetry, the art form built on metaphor, can both communicate and respond to scientific research.

My poetry collection *Somewhere Among the Wildflowers* explores psychological well-being from both scientific and artistic perspectives. I draw on forms such as research articles, textbooks, and surveys to pull the poetry out of them. I imagine the emotional experience of participants who embody a psychological statistic and include citations to the study they could have participated in. Finally, I write about experiences of well-being that research can never examine, such as feelings of romantic love or belonging. Through storytelling and science, these poems celebrate flourishing.

Predicting Emotional Incitement for Misinformation Detection

Zora Che

Advised by Bryan Plummer, Assistant Professor of Computer Science, CAS

The rise of social media news sharing has significantly increased the dissemination and consumption of misinformation. Current machine learning research in misinformation detection has focused both on the network effect, as well as the content itself. Sentiment analysis has been leveraged to aid the detection of misinformation by analyzing the media content using natural language processing for text and image processing for visual signals. Multi-modal fusion techniques are used to combine the features of the two modalities for prediction. Beyond the emotion of the content, the emotion incited in the viewer often plays a significant role in how misinformation is propagated through social networks. The correlation between content emotion and incited social emotion is not simplistic nor deterministic. My research is focused on predicting emotional incitement from social media content with the hypothesis that it would aid misinformation detection. Moreover, modeling emotional incitement may also be used as a filter for content that is more likely to be propagated, serving as a priority metric in determining which pieces of media content to focus on when monitoring for misinformation spread.

Towards this end, I created a multi-modal Twitter dataset with tweets, images, and tweet replies for training emotional incitement prediction. The model trained on the dataset with reply emotion labels is then used as an emotional incitement module in misinformation detection. The dataset will also be released to benefit further research into predicting emotional incitement from multi-modal social media data.

545

2:15

A Rhetorical Analysis of the Rights of Nature in Christian and American Legal Texts

Maelee Chen

Advised by Jay Wexler, Professor of Law, LAW

"I am the Lorax. I speak for the trees." In the popular children's book, The Lorax, Dr. Seuss explores environmental advocacy through the mouthpiece of a fantastical creature. Reminiscent of this rhetoric, an international legal movement called "the rights of nature" is gaining traction. From Ecuador to New Zealand, it furthers the idea that natural objects like wildlife and rivers should be granted legal autonomy and agency. Christianity and the legal system both influence and reflect key stakeholders' ideals in the United States, being the dominant religion and overarching power structure respectively. This paper analyzed primary sources to discern their rhetorical approaches to the rights of nonsentient nature, that being land, water, air, and plants. I explored the following questions: how do Christianity and the legal system value nonsentient natural objects? Who assigns this value? Why is nature considered valuable (or not)? From analyzing the Christian sources, we see recognition of nature's intrinsic worth and a call to stewardship as a duty, concurrent with a fundamental anthropocentrism. On the surface, the outsourcing of nature's worth to God as opposed to humanity might seem anti-anthropocentric. However, human exceptionalism combined with nature's desacralization reveal that within these texts, Christianity seems to be fundamentally opposed to the rights of nature. Even alongside a desire to protect the environment, the legal texts view nature pragmatically as property with utility value rather than as legal persons with defensible interests. Despite sharing similar values, Christian environmentalist groups' idealism remains unconvincing in the economically, practically-minded American legal system through amici curiae. Ultimately, these anthropocentric trends reveal that the rights of nature movement could not take hold in the United States. Eliminating this increasingly popular avenue to environmental protection is disheartening in a moment where climate change is an ever-pressing issue and environmental justice an executive priority.

545
2:00

Web Design Aesthetics on Consumer Buying Decisions

Maggie Chou

Advised by Tobe Berkovitz, Associate Professor of Advertising, COM

The purpose of this exploratory investigation is to study how aesthetic values of two-dimensional design structure can impact consumer perceptions of a brand and how visual elements can affect purchase behavior. Data gathered assists in the understanding of the relationship between graphic design and consumer behavior. In order to dissect this relationship, I designed a survey that asks participants about their online shopping habits and how visual aesthetics play a role in their purchase decisions. Using smaller focus groups, I also conducted a series of interviews where I asked participants to imagine a virtual reality shopping tool that will create a more interactive experience and ask them to imagine how this tool may affect their purchase behavior. I asked them to rank the importance of a series of attributes found in many online shopping tools and presented self-designed blueprints of design interfaces to find out which layout is the most effective. To ascertain the perspective of advertising professionals, I interviewed four Boston University alumni who are recognized as leaders in the industry. Their ideas are integrated within my work on this capstone. Using the collected data and information gathered, I redesigned the browser interface of Amazon for a more user-friendly shopping experience. These changes in web design could alter the future of digital marketing and the online shopping industry for years to come.

613A

9:15

Spectroscopic Analysis of the Phycocyanin 645 Light-Harvesting System in Algae

Lexia Cicone

Advised by David Coker, Professor of Chemistry, CAS

One of the solutions for the growing climate crisis is transitioning energy supplies away from fossil fuels and toward renewable energy sources. In order to sustain an energy system largely consisting of renewable energy, our sources need to be as efficient as possible. Solar energy has been coveted as a reliable source of renewable energy, but in order to utilize it to its full potential, we must first understand the efficient processes of photosynthesis and energy transfer that already exist in nature. In this research, I studied a complex commonly found in algae—the Phycocyanin 645 (PC645) system—as an example of a highly efficient light-harvesting complex. There are two methods to analyzing complicated systems: modeling and experiments. This work looks to understand how the PC645 complex harvests light through modeling by combining molecular dynamics to capture the fluctuations in the local structure of the complex along with quantum dynamics to model the excitation energy transfer process. Both the molecular dynamics and quantum dynamics are important for a more complete understanding of the highly efficient excitation energy transfer process that takes place in PC645. Using this knowledge, we can guide the novel design of materials for applications in solar panels that can convert solar energy to electricity through a more efficient process.

613B

5:30

Honesty is the Best Policy - Devising a Framework for Assessing the Environmental Transparency of Mass-Produced Fashion Brands

Izzie Collier

Advised by Phyllis McGinnis, Senior Lecturer of Marketing, QST

In 2020, I decided to commit to exclusively purchasing sustainable clothing. Throughout this 2-year long journey, one of the greatest frustrations I encountered was not knowing which brands I could buy from under my own definition of "sustainable fashion". The fashion industry is one rife with deception and I was left frustrated by the lack of transparency and the prevalence of greenwashing - the corporate practice of misleading consumers about the environmental practices of a company. This experience motivated me to devise a system for assessing transparency among mass-produced fashion brands, as it pertains to environmental sustainability.

My specific research goal was to measure the transparency of brands within this industry, focusing solely on environmental sustainability reporting. By exploring the different qualitative and quantitative aspects of transparency, such as the accessibility and detail of sustainability information and the disclosure or lack thereof of key environmental factors like energy and water usage in production processes, I have created a framework that achieves this goal. This method of assessment is intended to be transformed into a website containing transparency scores and an explanation of the factors encompassed within them. The broader aim of this work is to guide consumers to the more transparent fashion companies, allowing them to make informed decisions about their clothing purchases, and ultimately encouraging greater transparency among mass-produced fashion brands.

Designing, modeling, and constructing synthetic gene circuits based on protein oligomerization

Hannah Collins

Advised by Ahmad Khalil, Associate Professor of Biomedical Engineering, ENG

Synthetic biology is a broad, emerging multidisciplinary field that includes not only the modification of existing DNA, but also the creation of entirely novel DNA de novo. An input signal's presence triggers the DNA's translation and thus the formation of output proteins, which in turn directly control cell composition and function. This type of system, comprising input regulatory molecules, DNA sequences, and output proteins, is referred to as a synthetic gene circuit (SC). It has boundless potential, removing the constraints of genetic engineering, so that a system can be fabricated without reliance upon pre-existing DNA. However, the inherent complexity of biology limits the extent to which synthetic biology is currently applied, and controlled experimentation and modeling must be done on any proposed circuit design.

One previously unexplored opportunity for synthetic biology, which our project addresses, is for multiple input molecules, rather than one in isolation, to together control gene expression. Reliance upon two inputs to activate output allows for greater specificity and fine-tuned output control and makes an SC more akin to natural biological systems. In the presence of both small molecule inputs estradiol and aldosterone, a functional protein output is synthesized; otherwise, the output protein is inactive and cannot influence cellular behavior. Through a series of experiments, we measured output concentrations over time in response to time-staggered introduction of inputs. After data collection, we developed a set of equations based on assembly kinetics that describe the circuit. This was the basis of a computational model, from which we derived parameters integral to the system, including maximum induction, induction time constant, and decay time constant. By mathematically modeling our system under defined conditions, we can now accurately predict cellular response. Our work has improved the understanding of how these proteins interact *in vivo* and could lead to eventual adoption of the circuit for downstream therapeutic applications, such as CAR T-cell therapy or biosensors to recognize pathogens in the body.

613A

9:15

Kerry & Deb

Emma Grace Cowan

Advised by Paul Schneider, Professor of the Practice of Film & Television, COM

For my Keystone, I took the College of Communications Production 3 Thesis pathway. Instead of a research-based project, my keystone was more experience based. I applied as a director, which meant I had to find two scripts (either that I wrote or written by someone else) that I was interested in working on and submit them along with my application. Before being accepted, I workshopped the scripts over the summer of 2021 with the screenwriters and two professors who ran the class. By August, I was notified of my acceptance and my attention shifted to one of the scripts I had submitted, "Kerry & Deb". This script was based on a story that my mother had told me, about a time when she had gone into the wrong apartment when looking for her best friend Deb—my mom's name is Kerry! I shared the story with a screenwriting friend, and we worked together to turn it into a script. Upon entering the class in September, we workshopped the stories again, and then split up into teams to work on each film. I worked closely with a producer and a cinematographer to plan out our shots, hold auditions and cast our actors, recruit more team members, and come up with a shooting plan. We shot over the course of five days, split over the course of two weekends, and at 4 different locations. My main role during the filming was to make final decisions on things like costumes and shots, and then to direct my actors in how the action of the scene is supposed to play out. We wrapped our shooting on October 24, 2021, and since then I've been working with assembly, sound and color editors to finalize the film. This process has taught me a lot about turning an idea into a completed film. I have learned how to solve problems on the spot, and also what details need to be better planned out ahead of time. I have also learned a lot about the style of filmmaking that I hope to pursue in the future.

613A

2:45

Fighting for Peace: The Rose Dabney Forbes Story

Catherine Devlin

Advised by Nina Silber, Jon Westling Professor of History, CAS

No one can predict who history will remember, but none of Boston's twentieth century elite would have expected Rose Dabney Forbes to be forgotten. The daughter of the U.S. Consul to the Azores and a celebrated activist, Forbes served as an officer of the Massachusetts Peace Society, the chairman of the Massachusetts branch of the Women's Peace Party, and on the advisory council of the World Peace Foundation. Forbes' donations kept alive multiple peace organizations, she was granted influence in otherwise male dominated spaces, and her guest lists included presidents and European nobility. Yet no secondary sources tell her story.

"Fighting for Peace" is the first secondary source dedicated to uncovering the story of Rose Dabney Forbes, but it does not argue that readers should unequivocally consider Forbes a hero. Instead, in tracing the life of a woman who was so prominent for her time yet so quickly forgotten, I examine why and how we remember historical figures, whether remembrance requires admiration, and how patriarchal historiographic norms lose women's stories.

Based on archival documents and biographical theory, I argue that Forbes and her peers complicate a male-centric historiographic tradition that favors radical figures. To forget Rose Dabney Forbes and her fellow peace activists is to deny the incredibly powerful work they completed from within their gender and class system. By tackling international issues from parlors and knitting circles, these women disprove the separate spheres and the public vs. private perspectives that dominated 1970's and 1980's gender studies discourse. They did not need to enter male spaces to enter political conversations, and they wielded social networks to benefit their cause. Remembering the peace movement requires a reframing of how we write biography that moves away from male-dominated narratives rather than trying to inject women into an already written story. Let's start with Rose Dabney Forbes.

545

1:30

Highlighting the Magic of Shimane: Developing the Anime Pitch Deck

Mira Dhakal

Advised by Jodi Luber, Associate Professor of Practice of Film & Television, COM

Over the past few years, anime has been rising in popularity around the world, thanks to its increased availability on major streaming platforms. To this day, the genre continues to captivate both domestic and foreign audiences, remaining one of Japan's most popular forms of entertainment.

For my Keystone Project, I have developed a pitch deck for *Sumi & the Spirit Seekers*, a whimsical and action-packed original anime series about a young girl named Sumi who moves to Shimane, where she discovers that she has the ability to communicate with the spirits of the region. Thrown into an entirely new environment, Sumi must learn to reawaken the spiritual energy of the land before it's too late.

The purpose of this show is to spark interest and generate tourism in the rural Shimane Prefecture, a historically significant region located in southwestern Japan. Although Shimane is currently the second least populated prefecture in the country, I hope to introduce historic and spiritual landmarks of the region as well as instill a feeling of magic and wonder in audiences when they see all that Shimane has to offer.

When creating the pitch deck, I conducted market and competitive research of anime fans and popular anime shows and researched Japanese culture and literature to develop ideas and episode arcs. A lot of my research was qualitative, as I leaned into the use of surveys to figure out what my target audience (Gen Z anime fans) was watching and why. In the process of creating my pilot script, I held a table read with actors and had a feedback session afterwards to understand what worked, what didn't, and which parts of the script resonated with prospective audiences.

The final pitch deck includes a pilot episode, show bible, storyboards, and original artwork concepts for the show.

613A

3:30

A Proposal For A BU Summer Environmental Science Outreach Program

Morgan Haas Donohue

Advised by Anne Short Gianotti, Associate Professor of Earth & Environment

The next generation of science researchers must be more diverse. Diversity fosters research that is strong, innovative, and equitable. However, the sciences have excluded and marginalized researchers of color, women, and members of the LGBTQIA+ community for centuries, and environmental science remains one of the least diverse disciplines. The pathway from high school to a STEM career is fraught for members of these marginalized groups. To address this problem, research centers have established science education outreach programs for marginalized groups. Students who participate in these programs have reported prolonged participation in STEM studies, and further opportunities in the STEM fields. This project looks into how science education outreach programs increase opportunities in STEM for marginalized students. Successful programs partner with research institutions, put students on teams to complete hands-on research projects, and build support networks to encourage continued studies. This kind of science education outreach program can and should be built at Boston University to support the STEM education and careers of Boston-area high schoolers. This project then outlines a proposal for the creation of a pilot environmental science outreach program at BU by developing a plan for building relationships and community with Boston Public High Schools and the structure for a six-week program engaging in hands-on environmental research at BU.

613A
10:30

Ending A, Ending B, Ending C: An Exploration of the Murder Mystery and the Latent Choose-Your-Own-Adventure Film Genre

Sophie Falkenheim

Advised by Marni Zelnick, Assistant Professor of Film & Television, COM

In recent decades, multiple-ending films have become more common, including those which allow the viewer to "choose-your-own-adventure" (CYOA), turning the audience from a passive crowd to active drivers of the story. This project adds to this latent genre with a story bible for a four-ending CYOA murder mystery film and a plot "map" that illustrates the structure of the film's various sequences. Although this genre offers endless possibilities for expansion and demands that the viewer consumes the product multiple times, professionals in the entertainment industry see it as a risky investment. CYOA films are expensive to produce, making them a hard sell. However, the mixed-to-positive critical response to CYOA pieces such as Netflix's Black Mirror: Bandersnatch (2018) indicates that the interactive film genre has generated some intrigue in the global audience. In this project, the viewer's choices force the plot of the film to diverge into one of four endings, each of a different genre and with different plots and protagonists. This project finds that the structural integrity of the plot–that is, coherence, consistency, and lack of plotholes–poses the biggest challenge to the creation of CYOA films and that consequently, the CYOA genre may struggle to gain widespread traction. However, it also finds that CYOA makes up for its deficiencies with story breadth and audience engagement. As streaming platforms and networks compete and strive to become essential to their subscribers, they would be remiss to altogether reject the interactive genre on grounds of cost or effort.
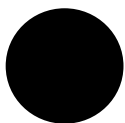
Analyzing legislation efficacy on mental health resource access

Alex Floru

Advised by Randall Ellis, Professor of Economics, CAS

Mental health resource access in the United States is challenged by stigma, accessibility of clinics, high out-of-pocket costs, and other variables. Even with comprehensive insurance, copays often remain high. Furthermore, those on federal or state funded insurance plans face challenges not presented to individuals with private insurance. For the purposes of this project, I define mental health resources as any certified treatment centers that provide inpatient or outpatient care, ranging from community treatment centers to large psychiatric hospitals. The focus of this project is to provide a comprehensive background on the history of mental health treatment in the United States, with an emphasis on the state of Massachusetts. Government-collected data is used to highlight trends of clinics and patient-level data nationwide and in Massachusetts. Certain laws, such as the Massachusetts Parity Law, are analyzed in conjunction with mental health data trends to observe any correlations with state and federal policy. Finally, this project provides policy recommendations based on the data analysis.

613B
4:30

"Need Money for Birkin": Ethical Investment and the Exclusive World of Luxury Fashion

Sydney Gerbel

Advised by Ekaterina "Katya" Gnedenko, Lecturer at the Department of Economics, CAS

As sustainability moves closer to the forefront of the modern investor's mind, the Environmental, Social, and Governance (ESG) framework enables them to evaluate the non-financial factors contributing to their portfolio's performance and associated risk. A high ESG score indicates an ethically favorable rating and can have a meaningful impact on both the investor and consumer-facing sides of a business: a higher score can increase investor confidence by communicating lower risk and simultaneously attract customers who use their purchasing power to reflect preferences for high ethical standards. In the context of the public luxury fashion industry – a space known for unusual economic trends and rare input materials – the ESG methodology can be a helpful guide when seeking equitable, low-risk opportunities for investors and consumers alike. In order to quantitatively evaluate the effect of the ESG score on public luxury fashion houses' financial success, a novel data set was created to track relevant variables such as ESG ratings, revenue, and market value over a ten-year period. The data was run through a regression model that supports the hypothesized positive relationship between increased ESG scores and a company's financial performance defined as both revenue and market value. Such findings indicate that a sustainable evolution of the luxury fashion realm would not only benefit the environments historically burdened by the industry, but also may further assure the financial success of the field.

613A

10:15

Education Technology and The Culture of the Classroom

Jack Giunta

Advised by Nermeen Dashoush, Clinical Assistant Professor of Early Childhood Education, WED; Elena Forzani, Assistant Professor of Literacy Education, WED

Over the past year, the COVID-19 pandemic has forced the education sector to adopt an increasingly progressive approach to teaching as public schools turned to remote learning. As these schools return to in-person learning experiences this fall, the adjustment period offers the opportunity to explore how technology changes these experiences for teachers and students alike. In this case study, 15 fourth-grade students were randomly assigned to two experimental cohorts to assess their language usage and communication styles with respect to technology use during an English Language Arts lesson. One cohort utilized classroom technology laptops to complete the assignment, while the other cohort utilized non-technological materials (i.e. markers and poster board). The resulting analysis of the groups' recorded conversations indicates a notable difference in student interactions: students in the technological cohort used sparser, authoritative language whereas students in the material cohort used more verbose, descriptive language. Understanding the relationship between technology and classroom culture is pivotal in ensuring that students are able to receive the best education possible—as such, the findings detailed in this paper are critical to consider when developing and implementing future educational technology.

613A

9:15

Interactive effects of microplastics and climate change stressors on gene expression in endangered Caribbean coral Acropora cervicornis

Katie Greene

Advised by Sarah W. Davies, Assistant Professor of Biology, CAS

Climate change, one of the greatest scientific challenges of our time, is directly caused by anthropogenic activities associated with increased greenhouse gas emissions. The effects of climate change are documented across all ecosystems, but can be specifically destructive in aquatic environments that are susceptible to additional threats (e.g., sea-level rise) not experienced by terrestrial ecosystems. Anthropogenic climate change is increasing seawater temperatures and ocean acidification, driving declines of coral reefs globally through coral bleaching events that can lead to increased coral death. These effects have been particularly detrimental for Caribbean reef-building coral species, including Acropora cervicornis. Marine organisms face additional, more direct, anthropogenic stressors, such as microplastics, but their influence on corals remains unknown. While the individual effects of these stressors are well-documented, the combined effects are less understood. In this Keystone project, we examine the independent and interactive effects of climate change stress (observed as both heat stress and acidification) and microplastics on the gene expression of the coral Acropora cervicornis. This project compares coral gene expression across four experimental treatments replicating microplastics and a combined global warming and ocean acidification stressors through transcriptome profiling. Principal component analysis and differential expression analysis were conducted to determine multivariate patterns between samples as well as identify differentially expressed genes (DEGs). This study identified 143 significant DEGs between control samples and those exposed to microplastics and climate stressors, as well as 57 DEGs from microplastics alone and 36 DEGs from ocean warming and acidification alone. Identifying which genes are differentially expressed among corals exposed to these stressors will provide a pathway towards understanding the full effects of climate change and microplastics on coral.

613A

1:15

The Perfect Playlist: The Intersection of Neuroscience, Music, and Art

Abby Gross

Advised by John Tullai, Lecturer in Neuroscience and Biology, CAS

Reading scientific literature can be quite difficult due to its rigid structure, complex language, and lack of public accessibility. These characteristics deter many from engaging with academia, as it often feels daunting and exclusive. My Keystone project is interested in bringing an immersive and interactive experience to reading scientific research. Specifically, I wanted to combine my love for neuroscience with my passion for music and graphic design. After researching the current literature about neuroscience and music, I created a website that publicly disseminates the findings of Dr. Mona Lisa Chanda's 2013 review paper, *The Neurochemistry of Music*. This review article is a comprehensive analysis of recent literature on the neuroscience of music, detailing four domains in which music influences health through neurochemical changes. Throughout my website I break the article down into digestible paragraphs, explaining the research in easily understandable language. I include handmade graphics and images to help the viewer visualize the complex neurotransmitter pathways being discussed. I also provide curated music examples and recommendations for casual listening while viewing the website. My website provides a foundation for the future of scientific literature, emphasizing the importance of interdisciplinary and creative work for making academia more accessible to all.

An Empirical Analysis of Out-of-Pocket Costs of Oral Breast Cancer Medications in 2018

Audrey Hager

Advised by Rena Conti, Associate Professor of Markets, Public Policy, and Law, QST

Among the incredible burdens of a cancer diagnosis, the structure of the American healthcare system means that paying for subsequent treatment can easily be one of the greatest. In order to measure how this has affected patients diagnosed with metastatic breast cancer, this paper employs an empirical analysis where costs are analyzed at both a per-patient and per-claim level basis to measure the out-of-pocket (OOP) expenses of prescription drug use for commercially insured women in 2018 using the IBM MarketScan database. This empirical strategy provides an estimate of both how much a well-insured woman in the United States with metastatic breast cancer must pay OOP per-year for her prescription drugs, as well as the average OOP costs of refilling a particular breast cancer drug. The results show that the average total OOP costs per-patient for prescription breast cancer drugs alone in 2018 was $103.63, representing 9% of the combined inpatient and outpatient OOP spending for these patients. A small minority of patients had over 10 claims, and their resulting percentage of OOP costs relating to prescription drugs elevated to 26%. From an individual drug level, the most expensive drug OOP was Palbociclib, a patented drug approved in 2016, where an adjusted 30-day supply of the drug averaged to $114.61 for a prescription refill. The least expensive was Tamoxifen, a generic drug approved to treat breast cancer in 1977, averaged to $0.57 per 30-day supply. Overall, these estimates suggest that on average, women prescribed more expensive drugs are paying higher OOP costs that are contributing to a sizeable portion of their cancer care.

Female White Supremacist Influencers and the Mainstreaming of Replacement Theory

Lauren K. Hagy

Advised by John D. Woodward, Jr., Professor of the Practice of International Relations, Pardee

This project explores the narratives female white supremacist influencers (FWSI) use in their videos on YouTube and how their rhetorical strategies help mainstream white supremacist ideas. White supremacists have been on social media since its inception and YouTube in particular is a popular hub for FWSI to create content and engage with mainstream audiences. I conducted both qualitative and quantitative research to determine the types of narratives used by both FWSI and public commenters on their videos. The top ten most popular videos by three FWSI were analyzed for fourteen commonly used white supremacist narratives and categorized accordingly. I also gathered word frequency data from comments on the videos to uncover the narratives used by commenters in response to the FWSI's videos. The FWSI all utilize anti-immigrant, anti-white genocide, and pro-white power narratives that center around a belief in Renaud Camus' Great Replacement Theory and a desire to prevent its actualization. Replacement Theory, or White Genocide, is a conspiracy theory that white people are the victim of a campaign to destroy and replace the white race. It is a particularly useful narrative tool for FWSI because it centers women as crucial to solving the problem, thus giving female white supremacists the opportunity to empower themselves and simultaneously help bring fringe ideas into the mainstream.

Europe's Democratic Illness: The Effect of COVID -19 on Democratic Erosion in Poland and Hungary

Cameron Helman

Advised by Sofia Perez, Associate Professor of Political Science, CAS

For the past decade, governments around the world have engaged in significant democratic erosion. Democratized nations are drifting towards authoritarian tendencies by centralizing executive power, weakening institutions, attacking civil rights, and reducing accountability. In Europe, Poland and Hungary are the most rapidly eroding democracies, with the Fidesz Party in Hungary and the Law and Justice (PiS) party in Poland taking concerning steps towards democratic decay.

COVID-19 presented a unique opportunity for governments to seize power and deepen control over their citizens. Via a literature review of the characteristics of democratic erosion and a comparative analysis of European states' COVID-19 response, this paper aims to demonstrate how Hungary and Poland used COVID-19 to backslide democratically. The paper compares Spain, France, and Italy's pandemic responses to those of Hungary and Poland, highlighting the differences in how emergency powers were used. Additionally, through a review of Fidesz and PiS' policy actions, the paper compares the severity of democratic erosion in Hungary and Poland during the pandemic. Following the initial waves of pandemic policy, Hungary remains further along in the democratic erosion process, but Poland is swiftly backsliding as well.

613A

1:30

The Creation of an Experimental Paradigm Involving Fiber Optic Imaging and fMRI in an Awake Mouse to Link Acetylcholine and Hemodynamic Activity

Joel Herbert

Advised by Anna Devor, Associate Professor of Biomedical Engineering, ENG

Studying attention in mice is a difficult task for several reasons, including, but not limited to, difficulty in discerning behavior, lack of knowledge about behavioral capacities and a tendency towards anthropomorphism, and technological limitations. Nevertheless, progress in this field has been made. Previous studies have shown that acetylcholine – a neurotransmitter – has a role in the transition from a non-attentive state to an attentive state. Studies have also shown that changes in blood flow occur when a brain shifts from a non-attentive state to an attentive state. While it has been posited that acetylcholine is at least in part responsible for this change in blood flow, this link has not been fully studied.

My project aims to address this lack of knowledge by linking acetylcholine to blood flow dynamics through simultaneous imaging experiments. This involved imaging acetylcholine activity and performing an fMRI on an awake mouse responding to an attentive stimulus, namely an air puff. While my results are currently inconclusive, I have thus far shown that not only is an experimental paradigm like this possible, but also that it is highly likely that acetylcholine and changes in blood flow are correlated. More research is needed to determine this with certainty, as well as identify how acetylcholine affects blood flow and why.

613A
11:15

A Wicked Problem: A Podcast About School Segregation in Boston

Marla Hiller

Advised by Anne Donohue, Associate Professor of Journalism, COM

Public policies often attempt to address what researchers call "wicked problems," or public policy problems that do not appear to have a solution. One wicked problem is school segregation in major US cities, including Boston. Hence, the title of this podcast, "A Wicked Problem," describes the issue at hand while paying tribute to iconic Boston slang. The five-episode podcast reports on how to analyze the success of education policy, Boston's history of mandated school busing, and the city's continued segregation and potential policy solutions. Listeners will hear interviews from policymakers involved in the "Boston busing crisis," current education scholars, and activists interspersed with my narration guiding the listener between interviews and including some of my own insights. For many, school segregation may seem like an issue of the past, left behind in the era of legalized segregation, but my research and interviews clarified how pressing the problem remains. This podcast does not come to a singular conclusion or find the perfect solution to school segregation; the series aims to demonstrate the issue's complexity as an example of public policy's many wicked problems.

613A

4:15

Using Elastic Scattering Spectroscopy (ESS) for Diagnosis: A minimally invasive method for assessing the health and viability of donated kidneys

Meghan Howard & Emily Oros

Advised by Ousama M. A'Amar, Lecturer of Biomedical Engineering, ENG; Irving Bigio, Professor of Biomedical Engineering, ENG

Chronic Kidney Disease (CKD) is a serious illness characterized by diminished kidney function that affects about 1 in 7 US adults. It consistently results in required dialysis and eventually kidney transplant(s). Currently, assessing the health of kidneys for transplant involves reviewing the deceased's medical record history and physically examining the organ ex vivo. The current gold standard of CKD diagnosis involves measuring the extent of interstitial fibrosis and tubular atrophy (IFTA) through a kidney biopsy, a risky procedure involving a large needle with many drawbacks such as time inefficiency, diagnosis variability, and high risk of tissue damage. Therefore, there is a pressing clinical need for a method to rapidly measure and assess IFTA for both the allocation of transplant kidneys and treatment of CKD without the guesswork or tissue damage. Our team has designed, built, and tested a minimally invasive fiber optic probe that uses light in the visible to near infrared region to measure the viability of kidney function. Photons of various wavelengths are scattered and absorbed by the tissue in predictable patterns. Specifically, increased IFTA at the interface of the cortex and medulla of the kidney increases the amount of scattering in the short wavelength region. We have tested our device on unlabeled tissue of an adenine rat model of chronic kidney disease and were able to find correlation between disease progression and changes in the measured ESS spectra. The results of this study will demonstrate the potential of ESS technology as a more accurate, rapid, and non-invasive assessment of IFTA for potential donor kidneys and its application for in vivo procedures.

613B

10:30

Solving Equations? Not so Easy

Yongyuan (Steve) Huang

Advised by David Rohrlich, Professor of Mathematics and Statistics

Studying integral and rational solutions to polynomial equations of several variables has motivated many groundbreaking results in algebraic number theory and arithmetic geometry for the past two centuries. Solutions to a special type of equations, known as *elliptic curves*, which are equations of the form $E:y^2=x^3+Ax+B$, are of particular number-theoretic interest, with applications in cryptography to enable secure exchange of information. We say E is defined over the set of rational numbers Q when A and B are integers. The Mordell-Weil Theorem says that the group of rational points of E, denoted by $E(Q)$, can be generated by a finite number of points, and the least number of points needed to generate $E(Q)$ is known as the *rank* of E. Given an arbitrary elliptic curve E, we have yet to discover a good way of computing its rank. One question that we want to answer instead is what the rank of E is "on average." To do so, we need ways to measure the "size" of E and determine the number of elliptic curves there are of "size" up to a constant X. We explore various best-practice methods of measuring the "size" of elliptic curves and prove asymptotic formulas for the number of elliptic curves bounded by "size" X when possible.

A Computational Model to Estimate the Incidence of Malnutrition in Yemen

Rana Hussein

Advised by Muhammad Zaman, Professor of Biomedical Engineering, ENG

The ongoing civil war in Yemen has severely restricted imports of food and fuel, disrupted livelihoods and displaced millions, worsening already high pre-war levels of food insecurity and bringing rates of acute malnutrition in children to the country's highest recorded levels. In their planning of services to treat and prevent malnutrition, humanitarian agencies project the needs of a program by estimating the expected number of cases for the coming year. For planning purposes, incidence, the number of new cases which develop and will therefore require treatment, provides the most appropriate metric for assessing malnutrition levels. Given that it is difficult to empirically measure incidence, the incidence of malnutrition is indirectly estimated using a standard mathematical relationship currently used globally. However, this approach has been shown to significantly underestimate incidence and fails to consider how rates of malnutrition vary over space and time. In order to provide context-specific and time-varying estimates of the incidence of malnutrition among children in Yemen, we developed a Markov model. Informed by health facility treatment data, local survey data and other estimates from the literature, the model quantifies the relationship between the interconnected system of determinants of malnutrition and resulting incidence in order to estimate changes to the burden of malnutrition over time. Our results may improve the existing approach for estimating and assessing the burden of malnutrition by providing more accurate and context-specific incidence estimates and allowing for a deeper examination of the system of determinants underlying the overall burden of malnutrition.

545
11:15

Group Identity and Corruption: How Beliefs, Biases, Criticism, and Information Processing Impact Participants' Responses to Corruption

Adi Jahic

Advised by Raymond Fisman, Slater Family Professor in Behavioral Economics, CAS

Through a survey presented to six-hundred adult Americans, this paper analyzed how readers with varying political party allegiances respond to criticism of politicians of the same or opposite political party (Democrat or Republican), which came from news sources with beliefs that are aligned or opposing to the readers (MSNBC or FOX) in order to understand the role of group preferences and beliefs in the response to criticism of in-group vs out-group members from in-group or out-group members. In other words, the effect of the identity of the source of criticism and the person criticized. We find, in agreement with previous literature, that people are less willing to believe or accept the criticism of a in-group member from out-group sources. We also find, novel to this research, interesting effects when the news source and the politician are of the same group identity: 1) when their identity is opposite to that of the readers, readers are much harder on politicians as compared to when the information is from an in-group source and 2) when their identity is the same as the reader, readers choose which of the two, the news source or the politician, is "more in-group" (i.e. "more Republican") based on their pre-existing beliefs on the media and politicians. Using this information, we propose a novel model of preferences and information processing based on a subjects biases and their perception of the source's biases. Lastly, since it is generally agreed upon that corruption is an unacceptable quality to be associated with a politician and since corruption confusingly still seems to have little to no electoral consequence, the criticism in the survey was focused around hypothetical acts of corruption in order to better understand how people update beliefs on politicians when informed about acts of corruption. We find that perceptions of a politician's guilt or the severity of their corruption is not consistently related with a participant's willingness to support said politician.

545

4:00

Analyzing the Wage Gap in Boston: A Cryptographic Approach

Sheila Jimenez Morejon

Advised by Mayank Varia, Associate Professor in the Faculty of Computing & Data Sciences, CDS

With cryptography, a group of individuals can compute a function of private input data, without revealing the input data itself. The Boston Women's Workforce Council uses this technology to analyze wages in the greater Boston area in an effort to measure and determine the wage gap between different demographics without learning anyone's salary or even any company's salary ranges. Because the data analysis provides privacy, it is challenging to verify that the computations are carried out correctly or if an individual manipulated the final output.

This project presents a new cryptographic algorithm that allows anyone to verify the correctness of the output data while maintaining the privacy of the participating individuals. The algorithm relies on a new encryption scheme with two unique properties. The first property allows the 'addition' of the input data contained in the encryptions, which provides privacy. The second property prevents an individual from claiming they encrypted data different from what they encrypted originally. These properties allow the algorithm to pin down any individual lying about their input data as well as any computation that was manipulated.

545

4:15

COVID-19 Vaccine Misinformation: Mitigating Mistrust in the Science Community and Public Health Initiatives

Grace Johnson

Advised by Trevor W. Siggers, Associate Professor of Biology, CAS

The COVID-19 vaccine has caused a multitude of change and discussion in the United States since its approval and release to the public. The discussion surrounding the vaccine, however, tends to center around the true efficacy and safety of the product. Both the risks of vaccination and understanding of boosters and antibodies have been widely discussed, with many misconceptions that have caused fear and mistrust towards the scientific community. This study helps to ease some of these concerns through a risks analysis of COVID-19 vaccine side effects and other general risks known in the science community and daily lives. An analysis of how antibodies and booster vaccines function will also be done. The information will be presented at a digestible level that does not require a science background via educational posters, aiming to make accurate, scientifically-backed information about the vaccine more accessible. In order to conduct this study a literature review was performed to analyze the many risks associated with the vaccine and other areas of life, as well as understanding the structure and function of antibodies and booster vaccines. A social media search was also conducted looking at trending Twitter topics to determine what the common misconceptions currently are. The outcome of this study consists of 2 posters, one regarding a risk analysis and one that presents the information about antibodies and boosters. These products aim to help provide an easier way to discuss and understand the common discussion topics and misconceptions about the vaccine, and clear these misconceptions. This would contribute to the science and public health fields by increasing trust in the vaccine and increasing vaccination rates for those who have been hesitant before.

613A

2:30

The Pressure to Post: Exploring How Social Pressure Influences Instagram Activism

Sarah Ju

Advised by Stephen Quigley, Associate Professor of Public Relations, COM

With movements like #BlackLivesMatter and #StopAAPIHate, social media evolved into a tool for activism, expanding the opportunities for discussion. However, given the public nature of social media, it is worthy to consider how others' perceptions of us affect our online persona and behavior. In other words, did you post to raise awareness or because of how you would be perceived if you did not? I aimed to better understand how social pressure influences the way college students engage with social media activism on Instagram. I conducted a survey to measure students' opinions on online activism as a practice, their driving motivations to participate, and their perceptions of others. Results showed that while it is not the leading motivation to participate in online activism, students do still think about how others will perceive them when posting. In fact, over 30% of participants agreed that a reason for posting is to not seem ignorant and complicit online. I then created the Instagram account, @pressuretopost to display and share my research in a visually-appealing and accessible way. This study provides better insight into how social pressure affects young people's online behavior. With further research, we can anticipate potential consequences and have global conversations about how we can make a change both on and offline.

613A

9:15

Developing an ECG Sensor and Smartphone Application to Monitor the Cardiac Health of Remote Patients

Brian Jung

Advised by Diane Joseph-McCarthy, Professor of the Practice of Biomedical Engineering, ENG

The primary goal of this project is to create an electrocardiogram (ECG) measurement device that is connected to a compatible software application, which can output patient data sufficiently accurate to be used for medical monitoring. The ECG communicates with the software application wirelessly by sending data through Amazon Web Services (AWS), a cloud-based computing service that can securely analyze, organize, and direct data to its destination. A preceding goal is to carry out comprehensive market and background research on existing at-home measurements and cloud-connected devices, to have a solid foundation of knowledge to begin developing this system. The expected outcome is to have a novel device with an easy-to-use design and software interface for patients that will output accurate and live ECG data. If the data is determined to be irregular, the patient will be alerted.

Ultimately, we aim to develop a clinically accurate, FDA approved method of acquiring and processing a 5-Lead ECG signal from patients whose geographical location or underlying health conditions necessitate remote healthcare. These key customer segments include elderly and immunocompromised patients, patients prone to cardiac complications, and patients in rural areas with little geographical access to healthcare facilities. Distinction of our approach and device design from competing devices on the market lie in our novel Internet of Things cloud computing methods, real-time feedback to the patient about electrode placement, and patient data encryption methods.

613A

4:45

To Hear What's Been Told: Responding to migrant fiction focused outside the anglosphere

Aidan Kaminer

Advised by Carrie Preston, Professor of English and Women's, Gender, & Sexuality Studies, CAS

Many United States media and cultural institutions push the narrative that the U.S. is a "nation of immigrants" and a destination for those in search of opportunity and "a better life." Though founded in some historical reality, the ubiquity of this mythos popularizes a false and potentially-harmful belief that the U.S. and other English-speaking nations — collectively known as the anglosphere — must be centered in stories of migration. The opposite is, in fact, true, and while counter-narratives exist, they typically receive less attention and readership. This project engages with three such novels that are written in English but center nations outside the anglosphere. While reading these works, I researched the context of each historical migration they focus on and reflected on my own family's story of migration. The final product is a series of creative nonfiction essays which respond to themes in the novels, their accompanying history, and my own family's experiences with migration and diaspora. A brief research summary accompanies each essay and contextualizes the original novels and the history each highlights. The ultimate aim of this project is to amplify voices which are already telling important but unheard stories and to encourage readers to learn and to listen more.

613A

11:30

Analysis of State Portrayals of the Risks of E-Cigarette Use and EVALI

Amanda Katchmar

Advised by Paul R. Shafer, Assistant Professor of Health Law, Policy & Management, SPH

In August 2019, an outbreak of "e-cigarette or vaping product use-associated lung injury" (EVALI) prompted many states and health organizations to warn against the use of electronic cigarettes (e-cigarettes) due to the presumed link between e-cigarette use and the illness. However, it was later shown that vitamin E acetate, a component of some vaporizable THC products, was the causative agent in this outbreak, not e-cigarette use. In this paper, we conduct a series of cross-sectional surveys of the websites of all state departments of health to determine how they communicated the risk of e-cigarette use during and after the EVALI outbreak. We then pair this analysis with data from the 2016 through 2020 Behavioral Risk Factor Surveillance System surveys to measure changes in cigarette and e-cigarette use. We find that by January 2020, a majority of states surveyed did not list vaporizable THC use as a cause of EVALI; however, differences in state messaging do not appear to be associated with changes in e-cigarette and cigarette use. Given the number of states that did not appear to update their messaging regarding the cause of EVALI, we believe that states should re-evaluate this messaging to accurately communicate the risks of e-cigarette use.

613A

1:00

Electric Skis

Waleed Khan

Advised by William Hauser, Associate Professor of the Practice of Mechanical Engineering, ENG

A large portion of the North American population has to deal with snow for several months at a time, and crossing over snowy terrain has always been a difficult task. Boots end up puncturing the snow, and the person quickly becomes tired and cold, which can even lead to hypothermia or frostbite. It is a common occurrence for many to not go grocery shopping or work due to snowy conditions. This can be problematic, as it can hit a domestic economy due to a decline in sales, productivity, and consumption for the day.

Current solutions in the market are quite limited, and the electric tread device that is available, which is one approach, is quite bulky and extremely costly. To remedy this situation, we propose electric skis, the future of winter mobility. This solution combines the traditional, light-weight cross country ski with a significantly smaller version of a snow mobile's suspension and tread system. The propulsion system does not require an engine but instead relies on a battery, a motor, and a tread-pulley suspension system. The product will not only be used for recreational purposes but can be used in general to transport users from point A to point B. The propulsion system is nearing its final stages but the controls will require some more revisions to accommodate the extremely high speeds the product can see. In other words, the motor is far stronger than anticipated and so we need to implement safety measures within the code to accommodate for that. As for the physical system, there are final adjustments left prior to testing.

613B

5:45

Here and There: A Collection of Works About Growing Up

Matt Kim

Advised by Brandy Barents, Lecturer of Writing, CAS

During a person's formative "coming of age", certain events impinge upon that person's affects and character; and as we mature, it becomes easier to forget the foundational aspects that have molded us into the people we see ourselves to be today. Of course, it may also become difficult or even unpleasant to pause and remember the very things that have carved the shapes of our soul into what they are. But it is this very reflection that allows us to embrace a mindfulness of our past and look forward into our future. In the form of an anthology of self-written works, I will portray the themes of interpersonal connection, reflection, and growing up by using media that range from poems to short fiction. With the anthology, I will have captured the essence of growing up, both as a person and as a soul. And in a loose-handed way, I hope that the reader will be able to imbibe some warmth of their past as they reflect on their own unique journey in "growing up".

An Evaluation of *Together We Feel Better*: A Mental Health Workbook for Children and Parents

Susritha Kopparapu

Advised by Carrie Preston, Professor of English and Women's, Gender, & Sexuality Studies, CAS

The Palestinian Diaspora has led to countless families' displacement to other countries in the Middle East or immigration to countries like the United States. These families have endured immense amounts of trauma, which has negative mental health impacts, especially on the vulnerable population of children. Although some interventions to support traumatized children exist, they are dependent on facilitators or funding, or generally have a target audience of children 11 years and older. The *Together We Feel Better* workbook, developed in partnership with the Palestinian Red Crescent Society and Palestinian psychologists, introduces coping mechanisms and concepts of communication to children in early childhood development (ages 6 to 8). Additionally, by providing parents with notes, the workbook strives to strengthen familial relationships through fostering resilience and establishing healthy emotional processing and communication practices at this early age. To evaluate the *Together We Feel Better* workbook's usability, acceptability, and efficacy, I developed a mixed-style survey which asks multiple choice and scale questions as well as open response questions to gather qualitative data alongside the quantitative data. While the distribution of the workbook and questionnaire has been delayed, this study assesses the overall process of developing and implementing such a workbook. Reflecting on challenges and limitations of this project may be valuable to the development of future programs seeking to introduce other mental health concepts to a young demographic or looking to provide families with autonomy and flexibility in future interventions.

A Misbehavior Detection System for Cellular Vehicle to Everything Technologies

Sam Krasnoff

Advised by David Starobinski, Professor of Electrical and Computing Engineering, ENG

As the information age continues to push the boundaries of interconnectivity, vehicular communication is beginning to incorporate modern innovations. Vehicle-to-Everything, or V2X, technology is poised to revolutionize the way that cars interact with their surroundings. By leveraging LTE signals, the V2X protocol allows for information to be exchanged between cars and any wirelessly connectable device, which includes civilian smartphones, smart bikes, and even other cars. By creating this network of devices, vehicles will be notified of road conditions, accidents, and other unexpected events with unprecedented speed and accuracy. Estimates predict that signals pertaining to left-turn warnings and blind-spot detection alone could prevent upwards of 600 thousand crashes and save over 1,000 lives each year.

However, with the arrival of this new technology comes new challenges and malicious actors. In normal use, V2X-capable devices will be transmitting and receiving vital data, like GPS position and velocity. If the transmissibility of messages is poor or if an attacker can jam the network through a Denial-of-Service (DoS) attack, then vehicles will be rendered unable to properly assess their surroundings. This compromises the integrity of the mesh network, and the likelihood of collisions skyrockets.

I examine the speed and efficacy of a cellular V2X network and explore the detection and possible avoidance of malicious signals sent by attackers. Through machine learning and cyber security principles, a monitoring system will be set up to detect and warn users in real-time about ongoing DoS attacks. By verifying the reliability and security of V2X technology by building off of strong foundations detailing the protocol, I will confirm its benefits while avoiding its pitfalls.

613B

1:30

deeper: A Mental Health Mobile Application

Nicole Kwon

Advised by Osama Alshaykh, Lecturer and Assistant Research Professor of Electrical and Computer Engineering, ENG

Those suffering from mental health illnesses constantly deal with miscommunication and misunderstandings from their loved ones, as it is difficult for both parties to empathize with each other and understand each other's needs. This problem is heightened on college campuses, where mental health resources tend to be difficult to access or insufficient. We conducted surveys with Boston University students who suffer from mental health conditions and their friends and family; the majority of participants who were loved ones stated that the methods that they used to support the person dealing with the mental disorder was less than 5 on an effectiveness scale from 1 to 10. Our project bridges this gap by creating a cross-platform mobile application for both mental health consumers and their loved ones. We designed a singular user interface that is simple and easy-to-use to emulate the familiarity of social media. The functionalities behind our application include monitoring mental wellbeing, engaging in a safe community, journaling, and sending and receiving supportive messages. The monitoring system was accomplished through machine learning, in which the application gathers information from an individual's interaction with the app (i.e. through journaling and surveys) to "quantify" an index of their mental health. It displays the results through a graph for the mental health consumer while the mental health consumer's index is sent to loved ones. This app also educates and connects loved ones by inviting them to ask questions in community forums and send messages of encouragement. In short, the aim of our project is not necessarily to build new connections or provide professional mental health services; rather, our value comes from strengthening the connections that the user already has.

613B
4:00

Using Photomosaics to Analyze Structural Complexity and Conservation Success of Restored Belizean Coral Reefs

Russell Laman

Advised by Les Kaufman, Professor of Biology, CAS

Coral reefs are degrading at an alarming rate globally, with estimates suggesting that by the year 2100, there will be no coral reef habitat remaining. In response, scientists have turned to coral reef restoration as a possible local solution to the global coral crisis. While coral restoration has become a widespread practice, few restoration efforts carry out the long-term analysis needed to quantify restoration trajectory and success, with 60% of all restoration projects reporting fewer than 18 months of monitoring in restored sites. This study analyzes the success of coral reef restoration at Laughing Bird Caye, Belize, over a 7-year time period. Reefs were analyzed by creating photomosaics, compilations of thousands of images taken on a reef yearly that are stitched together to create a 3D model. These models enabled me to quantify how the 3D structure of the reef changed over time, with higher values of structural complexity indicating a more complex reef framework, which theoretically should support a greater biodiversity of marine organisms. To further contextualize my research, I traveled to Belize, where I was able to document the restoration sites at the center of my analysis through photography. In this presentation, I will share many of these images, utilizing their photojournalistic power to portray the importance of coral reef restoration, while providing context to the analytical side of my project. My research provides new insights into the effects of coral restoration on reef dynamics, describing the positive and negative outcomes of planting coral. This work has the potential to educate and inform future restoration efforts, leading to more effective coral conservation in the future.

545

3:45

Categorizing Wikipedia: Analyzing the Network of Wikipedia Articles

Katie Lee

Advised by Daniel Sussman, Assistant Professor of Mathematics and Statistics

Wikipedia is a widely used online encyclopedia that is accessed by millions of people each day. However, much of the content and organization of this enormous resource is managed manually by volunteer editors. Though its structure makes Wikipedia an incredible example of collective knowledge, it also leaves content assessment to either individual users or external algorithms. There is no truly objective way to assess the reliability of an article, but inspecting certain qualities on a larger scale could be the first step to developing those types of insights.

The set of all Wikipedia articles can be formed into a network based on the internal links between articles. Using that graph of association, this project leverages network statistics to analyze the features and structure of Wikipedia articles and categories. It has culminated in an app which can be used to compare the features of articles based on their position in an overall network structure. In particular, the app allows for comparisons between sub-networks of articles belonging to either categories considered controversial or those which appear more mundane. The resulting comparisons provide insight to users about the connectedness and thus potentially the relative reliability of various topics on Wikipedia. The project itself does not seek to develop insights about the quality of Wikipedia. Instead, by giving users the ability to observe network data about what they are reading, the app encourages thoughtful consumption of information.

Are Social Media Recommender Systems to Blame for the Increasing Trajectory of Political Polarization?

John Lei

Advised by Stephanie Watts, Associate Professor of Information Systems, QST

Recommender systems in the context of social media provide personalized content to users by learning their behaviors and predicting preferences based on data such as demographic information. Recent developments in AI (artificial intelligence) have increased recommender system accuracy and functionality by helping to provide predictions despite a lack of data or user information (known as cold start problems). However, there has been growing concern over the role that these recommender systems have played in political polarization along partisan lines in the United States, as it is believed that more accurate recommendations result in increased polarization. This position paper systematically discusses the basic methodologies related to recommendation systems and whether they are a significant contributor to polarization and the development of ideological filter bubbles. Also discussed is a comparison of political polarization across countries that have seen a widespread increase of internet access such as the UK, Germany, Sweden, Canada to determine if the phenomenon is unique to the US or not. To examine the statistical significance of political polarization in comparison to recommender systems, a survey was administered which determined participant's position on the political ideology spectrum. This was recorded against time spent on social media on average per day across the past year. Results showed that people who spend more time on social media tended to be more politically involved, but nonetheless were inconclusive and statistically insignificant. These results are reflective of other studies exploring recommender systems and political polarization, which has not drawn a conclusive link between the two amidst other confounding factors. In order to properly diagnose the effects of recommender systems on political polarization, long-term large sample studies need to be performed. An analysis of regulations for recommender systems are discussed according to the current views of the issue.

545

5:00

"We Are Just Mentally Drained": A Qualitative Study of Substance Use Professionals During COVID-19

Caitlyn Leonard

Advised by Shannon Peters, Lecturer of Health Sciences, SAR

Prior to the COVID-19 pandemic, Massachusetts endured an epidemic – the opioid crisis. In 2020, more than 2,000 people in Massachusetts died from an opioid overdose, indicating a 5% increase in opioid-related overdose deaths from the previous year. Moreover, substance use professionals, who provide treatment for individuals with substance use disorders, experience high rates of burnout and occupational turnover. Such trends and ongoing barriers to substance use disorder (SUD) treatment necessitate a closer look at the current support services and the well-being of professionals providing those services.

Qualitative data inquiry was guided by Interpretative Phenomenological Analysis (IPA). Project participants were substance use professionals who have worked in substance use outpatient therapy for opioid use disorder for two or more years. All substance use professionals were employed at addiction centers in Massachusetts. Semi-structured interviews were conducted with participants (n = 7) from July 2021 to October 2021.

Analyses revealed three primary themes. The first theme, "I made myself more available, often to the detriment of my own zen," captures how substance use professionals cope with remote work and increased need for services. The second theme, "You gotta do what you gotta do. Like people need help," explores how substance use professionals seek to advocate and revolutionize SUD care practices for the purpose of empowering clients. The third theme, "There's definitely been some incredible benefits [of Telehealth] and some very hard things as a clinician," assesses telehealth's role in the future of SUD care, while presenting substance use professionals' mixed experiences with telehealth.

Overall, this project imparts an understanding of substance use professionals' well-being that is important given the ongoing COVID-19 health crisis and the expansion of telehealth in SUD treatment. Recommendations are provided for outpatient SUD program directors and management; these include how to enhance support resources for substance use professionals and clients, strengthen regional and interagency communication, and adapt to telehealth treatment. Suggestions for future research are also proposed.

613A

10:45

The Body is a Book of Stories – A Visual Exploration of My Asian American Identity

Selina Li

Advised by James Grady, Assistant Professor of Art, Graphic Design, CFA

There is a systemic issue with the way that our society views and treats Asian women. Asian women experience violence at alarming rates. There were 3,800 reported incidents of hate crimes against Asian women between March 2020 and February 2021. On March 19, 2021, seven Asian women were shot in Atlanta, Georgia. On January 16, 2022, Michelle Go died after being pushed into a subway in New York. These incidents reveal the violence and discrimination that Asian women experience every day. However, what is it like to live as an Asian American woman today? What did these AAPI women personally encounter in their daily lives?

In my keystone, I seek to provide insight to these questions. I explore my own experience as an Asian American woman through the most intimate parts of myself – my body. My body, which consists of various body parts, allow me to experience the world and receive how the world responds to me. My keystone is a 2-part visual journey. The first part consists of a series of hard-copy posters with QR codes that the audience can scan to unlock the second part - the digital experience. The digital experience is a website with separate pages that correspond to each different body part. Each page contains a short memoir about my lived experiences, working in tandem with web design elements to allow the user to fully immerse themselves in how I experience life in my own body. I use web design, graphic design, and storytelling to reflect on my experience as an Asian American woman. I explore my identity from the perspectives of my eyes, nose, ears, mouth, heart, hair, name, tattoos, back, hands, feet, legs, soul, and anxiety. Each body part and symbolic element that I wear on my body plays a pivotal role in my experience as an AAPI woman living in Boston.

In addition to the systemic undertone, I also reflect on my personal experiences with trauma and mental health. I look at the confusion, pain, joy, and hope that my identities bring. I look at how my body has absorbed and processed my lived experiences and how it has shaped the person that I am today. By crafting this memoir, I hope others who feel similarly to me understand it's ok to process all the hard feelings of being perceived as "different" in society and perhaps grow compelled to look within themselves too.

613A

5:30

Storyboards to Graphic Novel: Addressing the Challenges of Transmedial Adaptation

Emily Lyons

Advised by Davida Pines, Associate Professor of Rhetoric, CGS

This project examines the process and consequential challenges of adapting a story through different media, screenplay to storyboard to graphic novel. By undertaking the process of transmedial adaptation myself, I sought to understand the differences between the visual mediums of storyboarding and graphic novels and develop a creative method to bridge the gap between the two. Doing so allows any collection of storyboards– those created as pre-production tools for filmmaking, for example–to be enjoyed as a popular storytelling medium. Such transmedial adaptations would be a popular, potentially profitable untapped medium if created from well-loved films' storyboards, though the most significant effect this exploration could have, if successful, is that narratives could be enjoyed in a new way. To create this method, I used two major research tactics: (1) an in-depth exploration of the existing literature on storyboard-to-graphic novel adaptation, and (2) hands-on experience actually producing visual adaptations of a written narrative. I converted an original screenplay into storyboards, pre-production drawings used by filmmakers to plan the shots of a movie. I then translated this story to a graphic novel form, using the same drawings. Lastly, I distributed copies of these stories and gleaned reader feedback. Doing so allowed me to see how others view my work, how they relate to the story, and whether it registered when translated into storyboard, then comic. This Keystone demonstrates that the gap between design tool and narrative art can be filled, and serves as an example for pre-production art teams that are inclined to publish their work as a graphic novel in addition to a film. By developing a method of storyboard-to-graphic novel transmedial adaptation and examining the changes in form, style, and content that come with doing so, I have proposed a framework that filmmakers could use to produce both film and comic versions of a story, greatly streamlining the path in which graphic novels could be created.

613B

3:15

An Analysis of Pandemics on Carceral Spaces in the United States

Sam Macriss

Advised by Spencer Piston, Associate Professor of Political Science, CAS

People in carceral spaces are one of the most vulnerable populations during national and global pandemics. Due to a variety of factors, including overcrowding, lack of access to healthcare, lack of vaccinations, and high turnover rates, infectious diseases spread quickly and rapidly across carceral populations. These factors lead to higher mortality rates and outbreaks in these spaces than in the general population. Despite having experienced several large scale, deadly outbreaks of disease, the United States was unprepared to protect its citizens, particularly those in carceral spaces, with each new pandemic. This paper addresses the history and effects of pandemics in carceral spaces, including the 1918 H1N1 influenza pandemic, the AIDS pandemic, the H1N1 swine flu pandemic, and the COVID-19 pandemic. Through a literature review, this paper examines data collected of infection and mortality rates from these pandemics as well as the policies in the United States in place regarding healthcare and carceral spaces. Across all pandemics, the infection and mortality rates among carceral populations is disproportionately high compared to those rates among the general population. By examining this data, we can better understand why carceral populations are more vulnerable to disease and how to better protect them in the event of future pandemics.

613A

5:00

Islam and Christian America: How 9/11 and the George Bush Years Altered the Evangelical Perception of the American State and Islam

Lincoln Alex MacVeagh

Advised by Clifford R. Backman, Associate Professor of History, CAS

"Islam is a religion of peace," proclaimed then-President George W. Bush in 2001. This statement, delivered shortly after the terrorist attacks of 9/11, was made not only in response to the actions of Al-Qaeda but also as a rebuttal to the rising Islamophobia in one of Bush's biggest constituencies, evangelical Christians. In the years following 9/11, Islam became a major and urgent talking point of evangelical newspapers and preachers, a subject of numerous books and articles, and a generally pervasive presence in the minds of American evangelicals. My research explores the evangelical reconsideration of Islam, and specifically answers the question: why was an evangelical reconsideration of Islam urgent, and what new questions or challenges did evangelicals consider? I interject into the existing historiography an examination of two evangelical periodicals during the Bush years (2001-2008): the *Baptist Standard* and *Christianity Today*. I argue that the evangelical media's reconsideration of Islam took the form of a tripartite condemnation of the religion. The tripartite condemnation consists of assertions that: (i) Islam is false, while evangelical Christianity offers true salvation; (ii) Islam is inherently violent, while Christianity is tolerant or peaceful; and (iii) Islam is anti-American, an heir to communism and fascism, and an inevitable enemy of Christian America. I argue that the language used in both the *Baptist Standard* and *Christianity Today* repeats the language of Judeo-Christian America, originally utilized to promote solidarity in the face of fascist and communist threats to American identity, and specifically allies the power and values of the American state with Christianity.

613B

10:45

Development of a Dynamic Cushioning System with Continuous Piezoresistive Sensor Feedback for Pressure Injury Prevention and Treatment

Jessica Man

Advised by Paul Barbone, Professor of Mechanical Engineering, ENG

People who cannot move themselves, typically due to paralysis or amputation, are at risk of developing pressure injuries. Pressure injuries form when pressure applied to any area of the skin exceeds the occlusion pressure of capillaries for an extended period, resulting in ulcers, and in the most extreme cases, death. Patients with moderate to high rankings on the Braden or Norton scales, which measure pressure sore risk, must be repositioned every two hours by a healthcare professional or caretaker.

Our goal was to develop the first cushioning system that removes the need for human intervention in the prevention of pressure injuries. Our objective was to use piezoresistive sensors to measure pressure across the contact area, and use this feedback to redistribute applied force, ensuring that the force applied at every point of the contact area does not exceed pressure and time threshold for pressure injury development. Our proprietary system uses fluid dynamics to inflate individual cells based on the pressure sensor system to provide a targeted response to differences in applied pressure. Our future plans are to expand the current prototype into a medical mattress.

613B

3:30

Streaming Services: Success Indicators and Future Prospects

Audrey McMillion & Sushane Sharma

Advised by Ashis Gangopadhyay, Associate Professor of Mathematics and Statistics

In the 21st century, online streaming services are changing the way that the average person consumes media. Modern day media streaming services rely on monthly subscription revenue to operate, in contrast to the traditional model of physical distribution of media. This Keystone Project explores the factors that allow companies to utilize this relatively new business model to increase and sustain revenues. Our project focuses on major streaming services including Netflix, Spotify, and Pandora, and sheds insight into the key variables that impact the companies' financial performance. For Spotify and Pandora, we generate a finite distributed lag model; our key response variables include both quarterly and yearly revenue and our key covariates include number of users, premium subscribers, streams, lagged revenue, and quarterly effects. For Netflix, we focus on a time series analysis to study quarterly revenues over the span of 16 years (i.e., 2005-2021). Ultimately, we develop three separate predictive models that project the future revenues of these streaming services. For Netflix, we present an ARIMA model that outputs forecasts for all four quarterly revenues in 2022, all of which suggest that Netflix will continue to see an upward financial trajectory in 2022. For Spotify and Pandora, we produce finite distributed lagged models with adjusted R-squared metrics of 0.993 and 0.994, respectively. Additionally, Spotify's model outputs a forecast for Q1 2022, projecting an upward trend in Spotify's quarterly revenue. Ultimately, our models and predictions inform Netflix, Spotify, and Pandora of their promising future prospects in today's fast-paced streaming industry.

613A

9:15

Water Harvesting: Producing Drinkable Water from Moisture in Air

Trevor Melsheimer & Gayatri Sundar Rajan

Advised by William Hauser, Associate Professor of the Practice of Mechanical Engineering, ENG

One out of six people lack adequate water for drinking, sanitation, or hygiene. Water scarcity is especially prevalent in remote, dry, and arid locations where rainfall and access to bodies of water is limited or inconsistent. Although water can be purified or desalinated centrally and piped to distant locations, such operations are complex, energy-intensive, and cost-prohibitive. Therefore, there is a need for a low-energy and low-cost method of reliably producing drinking water in remote arid desert regions.

Our project is a device capable of producing potable water from moisture in air through a desiccant, a water-absorbing salt. At night, the desiccant absorbs water from humidity in the air. Then, during the day, our passive solar heating system evaporates and condenses the captured water to produce drinkable water. The heating system also regenerates the desiccant preparing it to restart its absorption cycle the next day. Our goal is to extract one liter of drinkable water per day without any external power input. Through our water harvesting system, we are demonstrating a low-energy, cost-effective, and culturally conscious solution to water scarcity in remote, arid environments.

613A

2:15

Improved Design and Manufacture of Filtering Media for Water Treatment Systems

Luisa Mesa Uruena

Advised by Enrique Gutierrez Wing, Master Lecturer of Mechanical Engineering

Water filtration in aquaculture systems is essential for the removal of biological waste to ensure fish have a high-quality habitat. Bead filters are widely used for this purpose as a low-energy-consuming option. As water flows through the system, physical contaminants become trapped in the spaces between food-safe plastic beads, while a thin film of bacteria on their surface aids in the chemical clarification of the water. The beads are then 'backwashed,' meaning air is pumped into the filter to shake them and remove excess biofilm and trapped waste. However, due to their small size, some beads may also escape with the filtered water through the outlet mesh during backwashing, introducing plastic contaminants. This is an issue faced by the sponsor of this project, Aquaculture System Technologies, LLC. (AST). We have developed for AST an improved bead that is larger than the current design to prevent loss, while maintaining its ability to form a biofilm. We implemented design for manufacturing and assembly (DFMA) principles and developed a scalable manufacturing method, as thousands of beads are required per filtration system. Through rapid prototyping and implementing a small-scale testing chamber for our beads, we were able to finalize manufacturable designs which exceeded the 50% porosity baseline required for proper trapping of physical contaminants, had a density smaller than 1 g/cc with a protected biofilm layer ensuring beads do not sink, and were larger than ¼ inch in all dimensions to prevent loss through the outlet mesh.

613B

2:45

Controlling brain waves to treat Alzheimer's Disease

Trey Moore

Advised by Felipe Schiffino, Instructor in Psychiatry, Harvard Medical School

Alzheimer's Disease (AD) is the most common neurodegenerative disease, affecting over six million Americans today. Those with AD suffer from memory impairment, personality disturbances, and other cognitive deficits. These symptoms originate from the toxic build-up of amyloid-beta (Aβ) protein in the brain and worsen as the disease progresses, stripping away the patient's identity until the body eventually fails. Our research focuses on fast brain waves (gamma waves) associated with cognition (e.g. learning, memory, attention) that are known to be aberrant in AD patients. Here, we investigate whether controlling these gamma brain waves with a deep brain stimulation method can be used to recruit the brain's housekeeping cells (microglia) to remove toxic Aβ from the brain. Our study used a genetically modified mouse model that produces a heavy Aβ burden. First, we performed brain surgery to inject a genetically engineered virus into the brain to cause the activity of a specific group of neurons to become sensitive to light and outfitted mice with optic fibers to enable deep brain laser stimulation as well as electrodes to record brain waves. Six weeks later, we injected mice with a fluorescent label (methoxy-X04) that binds to Aβ so that we could assess microglia uptake of methoxy-X04 labeled Aβ using flow cytometry, a fluorescence-assisted cell sorting technology. We treated mice with deep brain laser stimulation for 1hr/day for 1 week and confirmed that our treatment evoked strong gamma waves in two brain regions of interest (prefrontal cortex & hippocampus). Importantly, flow cytometry analysis showed that our treatment significantly increased microglia uptake of methoxy-X04 labeled Aβ indicating that controlling gamma waves with our deep brain laser stimulation method recruited the brain's housekeeping cells to remove toxic Aβ. Future work to understand the therapeutic mechanism of our treatment may reveal new targets for treatment of AD.

545

1:00

Why (and how) to study green industrial policy

Jackson Moore-Otto

Advised by Kaija Schilde, Associate Professor of International Relations, Pardee

Industrial policy is enjoying a political revival at the same time that climate change has become an increasingly salient political and policy issue. While the academic literature on this topic has correspondingly grown, key questions remain open, specifically with respect to the process of policy implementation. How are state interventions in support of decarbonization mediated by the bureaucracy? Are such interventions more likely to be carried out by bureaucracies charged with industrial development, or those charged with implementing climate policy? The existing literature does look at the bureaucratic level, for example Meckling and Nahm 2018 explore policy delegation and sharing between the legislature and the bureaucracy as a source of variation in climate state capacity; other work, such as Nahm 2017, looks at the role of industrial legacies in shaping the evolution of emerging green industries. However, the role of bureaucracy-level interactions remains understudied, as does a framework for country-level analysis of variation in how industrial policy is implemented. This project consists of both a framework to understand variation in how green industrial policy is implemented generally and the selection of country-level case studies with the aim of process the evolution of which bureaucracies implement this policy. This presentation focuses on the case for studying green industrial policy and the importance of a granular and institutionalist approach. We find that a development-state oriented process-tracing approach is most useful for future analysis and preview some results.

613A

2:00

Digging into Feminism and Queer Theory with *The Scoop*

Briana Morgan

Advised by Marie McDonough, Lecturer in the CAS Writing Program

The Scoop is a zine–a small magazine focusing on an unconventional or specialized topic– dedicated to exploring critical Women's, Gender, and Sexuality Studies issues through an intersectional lens. This zine is created for teenagers and young adults who are growing up in a bewildering landscape that includes both the wealth of misinformation available on the internet and the deliberate silences of most sex-ed curricula; it seems all the more urgent that young people have an educational resource that informs them reliably on feminist and queer theory. As a queer woman from Florida, I'm particularly concerned that legislation such as the "Don't Say Gay" Bill will leave LGBTQ+ students with even fewer options for understanding and expressing themselves. Through a more informal — but still educational — voice, funky graphics, and interactive exercises, the zine acts as a learning guide to those who do not know where to start when delving into feminism. It includes intriguing chapters that pull readers in with digestible explanations of complex feminist and queer issues such as intersectionality, the gender binary, health care, and injustice within the workplace. The information provided in the zine encapsulates foundational texts, both classic and contemporary, from a semester-long intensive reading project. In particular, it centers around the voices of feminists and queer theorists of color. The zine is available in physical copies, but it can also be accessed online through the digital publishing platform Issuu. The ultimate goal of *The Scoop* is to give others an easily-accessible resource to expand their mental lexicon, become more cognizant of social inequities, and feel empowered to spring into action to promote gender and racial justice.

Namjooning, Purpling, and the Collaborative Authoring of Celebrity

Gabriela Morgan Longo

Advised by Sean Desilets, Senior Lecturer of Writing, CAS

Familiarization with an author's writing, usually known as the canon, is how fans establish a baseline of knowledge from which they can then diverge and build upon in the creation of fan-made content such as fanfiction or fan art. In fandoms of traditional literary or cinematic media, the source of canon is easily delineated by the boundaries of its written or cinematic form. There is, in these fandoms, some kind of central text which fans may refer to as canon. In celebrity fandoms, where fans follow and support a celebrity or group of celebrities, the source of such a canon is not so obviously delineated. Affected by the present tense lived experiences of the celebrity in question and augmented by various accounts and speculations provided by fans about said celebrity, the 'story' which fans must familiarize themselves with is one that is living and constantly evolving. Nonetheless, celebrity fans do rely on some common fund of knowledge to perform their identities as fans. In the absence of discrete canons, contemporary fans have taken on a powerful role in the creation of celebrity identities. Using the uniquely interactive tools of digital fan culture, fans collaborate with the objects of their affection to create an emergent kind of shared knowledge. This can be exemplified in the way that fans of the Korean boyband BTS will tag their fanfiction as "canon compliant" on the fanfiction archive popularly known as AO3 when writing about the band members in their real-world role as Korean idols. This article aims to identify where and how fans of BTS define this canon and where fans draw the line between canon and fan-made, while also analyzing and explaining the way that this authority fans have over what is and is not grants them a new level of agency, and even authorship, which fans of traditional literary or cinematic content do not necessarily enjoy.

Like It Was a Game: An Artistic Exploration of Documentary Theatre About Syrian Refugees

Rona Moriah

Advised by Carrie Preston, Professor of English and Women's, Gender, & Sexuality Studies, CAS

Like It Was a Game is a theatrical script that explores the ethical and artistic considerations in documentary theatre about refugees. The play follows two graduate and three undergraduate students as they attempt to mount their production of *The People*, an original documentary play including verbatim transcripts from interviews they conducted among displaced Syrian populations. As the play progresses, tensions run high, friendships are put on the line, and ethical arguments get in the way of effectively putting on the performance. A growing number of (often white European) theatre makers are utilizing this technique to tell refugee stories, sometimes garnering wide critical and audience acclaim. While theatrical performances of this nature can raise awareness and even spark significant social change, they also have the potential to reflect a creator's incomplete and biased viewpoint or do injustice to the subjects while profiting from personal experiences, either monetarily or socially. This script serves as both a thought-experiment and an educational tool for audiences to examine documentary theater and question the circumstances under which it is created, and whether it has more advantages or disadvantages.

613A

4:00

Transgender Healthcare: Addressing Transphobia in the Medical School Classroom

Isabel Moring

Advised by Linda Doerrer, Professor of Chemistry, CAS

As of 2016, over 1.3 million individuals in the United States identify as trans. Despite the growing acceptance of transgender, nonbinary, and genderqueer identities in younger populations, the US healthcare system is lagging in treating these individuals. According to a 2011 study published in the Journal of the American Medical Association, medical schools across the U.S. and Canada teach on average only five hours of LGBTQ+ content over four years. Even though surveys have shown that medical students want to learn how to better treat trans patients, there is very little teaching. By not comprehensively including the needs of trans individuals as part of medical education, we are contributing to the transphobic state of healthcare.

One thing we are told on the path to allyship is to educate ourselves, and that is the idea from which this project was formed. I wanted to improve the technical education of physicians and the general education of the public. The first part of my project looked at the current research analyzing how often trans and LGBTQ+ content is taught in medical schools. During the research stage, I also looked at the effectiveness of guest panels and LGBTQ+ focused lectures in improving students' comfort with LGBTQ+ topics. Next, I created a sample medical school curriculum that included background, further reading resources, and learning objectives. The goal of this curriculum is to provide an outline for integrating the teaching of trans topics and gender-inclusive vocabulary into existing, common medical school courses. I have also created a public website compiling all my research into a digestible form for all audiences who desire to educate themselves. On this website, transhealth.care, visitors can learn about the history of transgender health care, the current state of trans health today, and obtain my curriculum as well as other resources for learning.

613B

1:15

Atomic Adaptations: Analyzing the Past and Present of U.S. Nonproliferation Policy in the Middle East

Cristina Rivera Morrison

Advised by Jayita Sarkar, Assistant Professor of International Relations, Pardee

Nonproliferation, or the prevention of the spread of nuclear weapons, comprises a central pillar of American foreign policy. To maintain an effective nonproliferation policy, the United States must be highly adaptive, adjusting to significant global events and technological advancements amidst a constantly evolving international arena. In my analysis of the respective nuclear programs of Israel and Iran, I explore the development and adaptability of twentieth- century U.S. nonproliferation policy within the context of the Middle East, as it gradually evolves through nonproliferation methods involving diplomatic agreements and economic sanctions. I find that because the Israeli nuclear weapons program emerged before the United States had established a comprehensive nonproliferation policy, the United States was ultimately unsuccessful in dissuading Israeli leaders from pursuing nuclear weapons. Nonetheless, the United States' encounters with the Israeli nuclear weapons program exhibit early U.S. nonproliferation thinking and efforts, including international safeguard inspections and "no test" bargaining. In the Iranian case, although Iran began receiving nuclear technology in the 1950s, Iran's nuclear weapons ambitions materialized after the United States had established a comprehensive nonproliferation policy and nonproliferation sanctions policy. The United States has therefore been able to exert its influence on both a unilateral and multilateral basis, culminating in the 2015 Joint Comprehensive Plan of Action. I argue that the challenges presented to the United States by the Iranian nuclear program's ongoing development have contributed to the United States' more recent transition toward counterproliferation mechanisms, measures designed to prevent nuclear proliferation at all costs if traditional methods have failed. My research suggests that the United States is likely to continue pursuing counterproliferation methods including proxy military, cyber, and financial operations to safeguard, regulate, and prevent the spread of nuclear weapons in the Middle East.

545

4:45

An In-Depth Analysis of Feminist Mobilization and Reproductive and Sexual Health Interventions in Bihar, India

Jessica Morse

Advised by Bria Dunham, Clinical Assistant Professor of Health Sciences, SAR

The female body's ability to make more humans has led to systems of oppression wherein their bodies are not fully their own. In the age of industrialization, development, and globalization, population control became seen as an acceptable response to concerns over the rapidly growing global population. Family planning programs have been utilized as a tool to control women's bodies by setting limits on the number of children a woman can have, the types of contraception they can use, and the sexual behavior they can engage in. These programs are supported by systems of inequality that spotlight and shame women's behaviors that defy societal oppression. In response, feminists have advocated against methods of population control in favor of a rights-based approach to reproductive and sexual health.

In this thesis, I have investigated the impact such feminist mobilization has had in changing the justification, implementation, and analysis of interventions that seek to impact women's reproductive and sexual health and rights. To determine this impact, I have developed an original feminist framework based upon current global feminist theories, prioritizing voices from the Global South, to use in assessing recent interventions in Bihar, India.

India has a dark and complicated history of forced sterilization and other forms of family planning that it still reckons with today. In particular, the state of Bihar has been subject to international and national attention due to its high rates of fertility and inequality. Through literature review, in-depth interviews with relevant actors, and publication analysis of related interventions, I found that there has been a shift from family planning towards rights and empowerment approaches, but there are still remnants of population control rhetoric that inhibit the full realization of reproductive and sexual rights.

613B

2:15

The Phenomenology of Addiction

Aash Mukerji

Advised by Walter Hopp, Associate Professor of Philosophy, CAS

From heroin to gambling to sex to caffeine, addiction is omnipresent and occupies a distinct social role. Through my investigations, I found the societal norms used to determine which behaviors constitute addictions to be problematic and largely incongruous. This project makes use of one preeminent question as a means of analyzing the greater issue at hand: What differentiates the drug addict from the professional athlete? Attention to one's health or the value of one's ultimate aims seem unlikely to work as explanations. Playing nearly any sport at the professional (or even college) level is disastrous for one's long-term health outcomes; if health was the driving concern of one's life, one would never dream of competing at such an echelon. And while there is no doubt that the Federers and Mayweathers of the world put in enormous efforts in order to achieve their laudable goals, does the serial drug user not also persevere to achieve some equally worthy end, namely, to realize that future in which their life is tolerable? As we can see, a number of responses seem available to the central question that drove my project, but they all peculiarly seem to fail under greater scrutiny. The objective of my work here is to prove that the differences between us and those we conventionally think of as "addicts" lie not in kind, but in degree—to demonstrate that addiction is a concept we all instantiate in our lives. In arguing that societal conceptions of addiction need serious reformation, this project aims to capture the phenomenological (or first-person perceptual) facets of addiction, a perspective that has, in my estimation, been severely lacking in both empirical and philosophical literature.

613B

1:00

Mapping Diabetes in Boston

Amos Mwaura

Advised by Sushrut S. Waikar, Norman G. Levinsky Professor of Medicine, MED

Diabetes is the seventh leading cause of death in the United States. Aside from diabetes increasing risk of mortality, the chronic condition requires several lifestyle changes, such as purchasing insulin, changing one's diet, and receiving dialysis in the event of kidney failure. While past studies have shown macro-level analyses of diabetes, demonstrating that Native Americans have a higher risk of developing diabetes in the US, and African Americans have a higher risk of developing diabetes in Massachusetts, comprehensive micro-analysis of diabetes risk within the city of Boston is limited in the current literature. The objective of this study is to better understand the factors affecting diabetes prevalence within Boston. Prevalence of diabetes in Boston's twenty-three neighborhoods was analyzed alongside the racial/ethnic distribution and socioeconomic status of each neighborhood. Distribution of grocery stores and parks in Boston's neighborhoods were also analyzed alongside diabetes rates, as these resources help prevent and manage type two diabetes.

The relationship between diabetes prevalence and neighborhood racial distribution showed the strongest correlation out of the parameters analyzed, with a moderate correlation of r = 0.67. The most interesting neighborhood is Mattapan, which ranked second in diabetes prevalence and first in minority percentage. Due to this study being an ecological study, individual level data is needed to draw conclusions regarding individual behavior. Thus, future studies should analyze cohort data to draw stronger conclusions on factors affecting diabetes prevalence. Furthermore, future studies should analyze grocery store and park distribution based on distance to the city center, as this methodology may better capture the proximity of these resources to each neighborhood.

613B

3:00

Investigating Associations Between Medication Use and Kidney Health in Nicaraguan Children

Anna Natrakul

Advised by Jessica H. Leibler, Assistant Professor of Environmental Health, SPH

Mesoamerican Nephropathy (MeN) is a form of chronic kidney disease of unknown origin, primarily affecting otherwise healthy young men in agricultural communities of rural Central America. MeN is a leading cause of death in the region. The etiology of this disease remains poorly understood, despite more than a decade of epidemiological research. Because MeN presents in young adulthood, we hypothesized that evidence of kidney disease may be observed in youth, and that use of potentially nephrotoxic medication may be associated with poor kidney health. We evaluated whether medication usage in Nicaraguan children is associated with dysuria (chistata) or low estimated glomerular filtration rate (eGFR), both of which are indicators of poor kidney health. In 2016, a BU-based team conducted a cross-sectional study of 658 youth in Nicaragua, ages 7-12 years. Medication use was ascertained through interview questions about frequency of use of NSAIDS and related painkillers, diuretics, urinary antiseptics, antibiotics, and potassium supplements, along with herbal remedies. Data were analyzed using comparison tests and age- and sex-adjusted logistic regressions, along with thematic coding of qualitative data on herbal remedies. Medications that were used most frequently included acetaminophen and ibuprofen, with 19% and 8% of participants reporting high weekly use, respectively. In comparison tests, weekly use of acetaminophen and use of three or more separate medications were each associated with lower eGFR (p<0.03), but these results were attenuated and non-significant in adjusted models. Weekly use of medication was associated with elevated risk (20-30%) of experiencing dysuria, but these findings were not robust. Based on free responses to our interview questions, 43% of all participants reported having used herbal remedies, with most reporting high weekly use of tea. Of the participants who used herbal remedies, 10% reported using such remedies at a high weekly frequency specifically for their renal system. While Nicaraguan youth report using common nephrotoxic medications with notable frequency, evidence that such use is associated with poor kidney health is weak. These findings will provide meaningful support for ongoing investigations of kidney disease in children in Central America.

613A

1:45

Towards a Livable Future: The Implementation and Legislation of the 15-Minute City

Gabby Ostoyich

Advised by David Glick, Associate Professor of Political Science, CAS

The "15-minute city" is an experimental urban planning initiative that has gained notable traction since its inception. At the heart of the concept is a model urban space in which metropolitan residents can fulfill six essential social functions (living, working, commerce, healthcare, education, and entertainment) at distances that take no more than 15 minutes to travel by foot or bicycle. Advocates suggest that the plan will transform the contemporary city into a more sustainable, accessible, and equitable locus of urban life. The following exploration begins with an intellectual history of urban planning in the recent past, tracing the genealogy of today's major metropoles and assessing the conditions that gave rise to the 15-minute theory. Building off of that groundwork, I determine the present "adoptability" of the 15-minute city by examining the innovation through the lens of significant policy change movements, like the push for more affordable housing and the bicycle advocacy campaign. This detour is necessary because the current 15-minute discourse prioritizes the technical at the expense of the political, leaving relevant stakeholders unable to identify actionable ways to implement the design. Thus, in my effort to uncover universally resonant tactics that any variety of policy change movements can leverage, I study the most effective capacity-building tools that help enshrine the housing and cycling agendas in legislation. Ultimately, by merging my examination of the 15-minute movement with a thoughtful contemplation of those adjacent efforts, I contribute original insights and work to bridge gaps in the existing literature. Through all of this, I devise meaningful prescriptions for the future of the 15-minute city and the best way to pursue its eventual application.

613B

11:15

Is what you see what you get? Exploring the relationship between viewing condomless anal sex in pornography, condom attitudes, and condomless anal sex among adolescent sexual minority males.

Christian Paredes

Advised by Kimberly M. Nelson, Assistant Professor of Community Health Sciences, SPH

Adolescent sexual minority males (ASMM) often turn to pornography to learn about male-male sex and relationships. Although pornography can be validating for some ASMM, pornography often portrays condomless anal sex (CAS) without addressing potential risk for sexually transmitted infections. Previous research documents a positive association between ASMM viewing CAS in pornography and engaging in CAS. This study assesses whether condom attitudes mediate the relation between viewing CAS in pornography and CAS engagement among ASMM. Understanding this relationship will identify areas of intervention to improve sexual health for ASMM.

ASMM (ages 14-17; N=154) in the United States were recruited in Spring 2020 for an online sexual health intervention pilot trial. Participants answered questions about their pornography use, condom attitudes, and condom use. Firth logistic regression was used to measure the associations between viewing CAS in pornography, condom attitudes, and engagement in CAS.

Participants were 16 years old (SD=0.9) on average. The majority identified as White (52%), with 26% identifying as Hispanic, 10% Black/African American, and 12% another race/ethnicity. Most participants (69%) reported that more than 50% of pornography featuring male-male anal sex portrayed CAS. Almost a quarter of participants (23%) reported engaging in CAS. Most participants (83%) had a mean condom attitude scores indicating favorable condom attitudes.

Our results indicate that condom attitudes may be more influential than pornography use for ASMM deciding whether to use a condom during anal sex with male partner. Future research should explore the predictive relationship between condom attitudes and condom use and identify factors that play a role in condom attitude formation.

545

10:30

Envisioning American Healthcare Reform in the Age of COVID-19: A Step Towards Countering Racial Health Inequities

Deep Patel

Advised by Alya Guseva, Associate Professor of Sociology, CAS

The COVID-19 global pandemic has amplified the complexities of the notoriously convoluted American healthcare system, which has had disproportionately adverse impacts on racial and ethnic minority groups in the USA. Americans within these groups, especially those enduring financial difficulties, have faced increasingly higher rates of COVID-19 infections and deaths, coupled with a lack of equitable access to treatment and vaccines compared to white Americans due to the systemic racism embedded within the national healthcare complex. In order to demonstrate these inequities, this paper answers three questions: first, what the specific shortcomings of the US private and public healthcare system are for low-income and racial minority groups during the pandemic; second, what type of reform is best suited to correct the specific problem of minority communities lacking access and trust to healthcare services; and third, which international healthcare systems can the US look to for potential solutions to the problems we face in serving these racial minority groups aptly during and beyond the pandemic. The primary failures revolve around an inability to provide sufficient healthcare coverage, financing, and quality of medical care for communities of color. During the pandemic, these problems have manifested with racial bias impacting how federal financial relief resources were dispersed, how testing centers and kits were distributed, and much more. The prevailing political movements for Medicare for All and the Public Insurance Option can both help to solve the issue of strengthening trust and access to healthcare services. Moreover, the effectiveness of the foreign healthcare systems of the United Kingdom, Switzerland, and Australia in achieving better health outcomes makes them models of reform for the present American system. Health equity will only become the norm by understanding these concepts and ultimately, eradicating the systemic racism in healthcare policy that prevents universal access to high-quality medical care.

Limitations of Hospital Room Standardizations for Patients with Obesity

Sheena Patel

Advised by Laura Driscoll, Clinical Assistant Professor of Physical Therapy, SAR

Most hospital rooms are standardized with regard to how the physical space is designed and what amenities are included, but this standardization is not always beneficial to patient care. In particular, obesity is a growing cause of concern, especially in the United States, yet hospital conditions are not always suitable for patients with obesity because the size and placement of the equipment, furniture, and space tend to be suited for the average individual and, thus, are not reflective of patients who may have different needs. Feelings of exclusion can negatively affect patients' wellbeing and view of themselves, thereby hindering and prolonging treatment and recovery.

The interconnectedness of our body calls into question the importance of holistic treatment in the healthcare industry. Patient mentality and outlook can be the difference between a rapid and healthy recovery versus a prolonged one with complications. Osteopathic medicine focuses on such an interconnected treatment and specifically identifies the significance of a patient's healing environment and the effect it can have on their mental and physical health. Thus, it is important for hospitals to create an environment suitable to the needs of all their patients rather than just the "standard type." This paper defines obesity as it is currently understood, explores how hospital standardizations are limiting to patients with obesity, investigates what effects those limitations can have on the treatment, care, and health of these patients, and identifies methods through which hospitals can provide optimal care for patients with obesity.

545

11:45

A Systems-Level Model of Spatial Navigation and Memory

Sawan Patel

Advised by Michael Hasselmo, Professor of Psychological & Brain Sciences, CAS

Spatial navigation and memory have long been among the most inexplicable abilities to describe at a systems-neuroscience level. Deficits in these abilities are commonly found in those suffering from Alzheimer's Disease, which approximately 20% of human adults will be diagnosed with in their lifetime. Critical to navigating a novel environment is to make sense of stable, surrounding cues for generating an internal representation of an agent's surroundings (e.g. Fenway Park is associated with Kenmore). Prior studies have associated such a system with various cell populations found in the mammalian brain. However, it is unclear exactly *which* of the several populations are needed to recreate an accurate representation of the environment in the form of a cognitive map. Additionally, common mechanisms in the literature either do not align with the recent discovery of bidirectional cells in the dysgranular retrosplenial cortex or explain navigation in darkness. We propose a new model that associates medial temporal lobe populations with the maintenance of a memory buffer of the surrounding environment and a connectivity structure between these populations. Additionally, we define a new mechanism for the retrosplenial cortex that explains the phenomenon of bidirectional cells. The model is composed of rate-coded neural populations which are implemented via computer simulation. It will yield a synthesis of our current understanding of electrophysiological research and methods of perception and navigation that can explain phenomena in the literature.

545

3:15

Understanding School Mental Health and Parent Guidance in Public Middle Schools: A look at Low-Income Neighborhoods in New York City

Clarence Perez-Mejia

Advised by Shelley M. Brown, Clinical Assistant Professor of Health Sciences, SAR

Schools are ideal areas for mental health prevention due to their access to students, flexible inclusion of staff, and ability to monitor student progress and health. Among city student populations, students attending public schools in low-income neighborhoods experience a range of disparities among multiple social determinants of health, increasing their susceptibility to ill-mental health. Parents act as essential stakeholders in school mental health and can positively influence student experience with mental health services if there is adequate parent inclusion and engagement. Therefore, my Keystone aims to understand the mapping of school mental health services available for New York City public middle schools in low-income neighborhoods and their guidance for parent inclusion. I used the publicly available dataset 2020-2021 School Mental Health (SMH) Service Coverage to summarize school mental health services in the desired population. After filtering for public middle schools in low-income neighborhoods, six schools were randomly selected to look at their guidance for parental inclusion via their publicly available online home websites. Best practices derived from the literature review around school mental health provided structure to understand these schools and their services' adherence to best practices in school mental health regarding parent inclusion. I summarized the mental health services by service type for NYC public middle schools in low-income neighborhoods from the dataset and showed the best practices for parent guidance present and missing within the six schools. Future qualitative research is necessary to understand the parent experience further specific to each mental health service type.

545

4:30

The Vanguard of Reconquista: Exploring the Extreme Right in Ukraine and its Influence on the Global Extreme Right.

Sebastian Porreca

Advised by Alexis Peri, Associate Professor of History, CAS

In the past decade the extreme right has grown from a collection of localized, national groups to a huge and complex web of international networks and groups that communicate, organize, and plan across thousands of miles. A key component of this international extreme right community is Ukraine, which has fostered a powerful far right movement in the aftermath of Ukraines 2014 Euromaidan political revolution and ongoing hostilities with Russia. I argue that the Ukrainian extreme right movement acts as a central node for the creation of extreme right culture and aesthetics, primarily through inspiration of international extreme right movements, as well as direct transnational participation in the Ukrainian extreme right. I will demonstrate that this influence of the Ukrainian extreme right can be especially observed in the overlapping yet distinct contexts of extreme right paramilitarism, street activism, and cultural phenomena such as concerts, sporting events and clothing brands. These subsections of the Ukrainian extreme right movement have exerted extensive direct and indirect influence upon a unified, international extreme right culture that emphasizes metapolitics, the process of changing social and cultural institutions/mindsets in order to create revolutionary social change, as a means to strengthen the extreme right as a cultural and social institution. Through examining extreme right paramilitarism, street activism, and cultural projects, and how they are participated in, mimicked, and utilized by the extreme right worldwide, I seek to analyze and describe the Ukrainian extreme right movement's creation and proliferation of extreme right culture and aesthetics. Understanding how this vision of extreme right culture and aesthetics is centered on and influenced by the Ukrainian extreme right allows us to gain a more nuanced perspective on how extreme right culture spreads and sustains extremist communities, and ultimately provides a new understanding of the extreme right as not regionalized, mutually exclusive movements who simply share ideology, but rather as an international movement that influences and is influenced by its constituent parts.

545

3:00

81

Babel in the Neapolitan Metropolis: An Analysis of Linguistic Representation and Purpose in Ferrante's *L'amica geniale* Series

Andrew Reilly

Advised by Nancy Harrowitz, Professor of Italian & Jewish Studies, CAS

Italy is rich in linguistic diversity: owing to its relatively late unification and its geographic isolation, the country is still home to numerous Romance dialect groups—each of which constitutes a separate language—in addition to standard Italian. The tensions and complexities of this diglossia, or a situation in which two languages or language varieties are used under different conditions within a community, led me to my project. I researched the Italian state's long-running use of language-planning to construct an Italian identity, a process which has relegated dialects to a lower status. I then explored this issue within the *L'amica geniale* quartet, dubbed the Neapolitan Novels in English, by Italian author Elena Ferrante. Throughout four novels, Ferrante frequently notes characters' linguistic registers and choices: characters have accents, they speak in Italian, and they speak in the local 'dialect' (Neapolitan). What purpose, then, does such linguistic differentiation serve in the course of the series? I began by noting each instance in which such linguistic markers were added, examining both the modifiers Ferrante attaches to different registers and the plot contexts in which language becomes relevant. Through both close readings and quantitative analyses of the phenomenon, I argue that Ferrante employs linguistic distinctions to re-contextualize the *questione della lingua*, a literary language debate dating to the Renaissance; to develop and accentuate the importance of place within the Italian context; and to construct the educational and class identities of both primary and secondary characters. Previous scholarship has in passing highlighted the importance of linguistic positioning in the quartet; this project proves that it is a key component of Ferrante's writing and provides a framework through which further scholarship can examine her body of work.

The Role of Cocaine-Associated Memories in Driving Relapse and Drug-Seeking Behaviors

Leanna Reynolds

Advised by Steve Ramirez, Assistant Professor of Psychological & Brain Sciences, CAS

Addiction is characterized by a continual propensity to relapse . Relapse-prevention strategies aimed at reducing the likelihood and severity of relapse following abstinence, focus on reducing cravings that lead to drug-seeking. Factors precipitating drug-seeking include drug-related cues, exposure to the drug, and stress. One factor not yet directly investigated is the contribution of drug-related memories on relapse. Conditioned Place Preference (CPP) has been extensively used to study relapse and is demonstrated when preference for a location emerges based on previous pairing with something rewarding (e.g., cocaine). To investigate the role of memories in promoting relapse, we infused an adeno-associated virus: AAV9-cFos-tTA-TRE-ChR2-eYFP into the dentate gyrus, of male c57BL/6 mice to "tag" cells involved in encoding a cocaine-related memory. Mice underwent cocaine (15mg/kg, i.p.) CPP training where they learned to associate cocaine with one side of the chamber and saline with the other. Following conditioning, all mice preferred the cocaine-paired side. We then extinguished this preference and hypothesized that both a priming injection of cocaine (7.5 mg/kg, i.p.) as well as optogenetically reactivating the cocaine-related memory we had tagged, would reinstate CPP. Thus, this study began an exploration into priming reinstatement using the memory of a drug, in comparison to the drug itself.

545
9:15

BALB/cByJ mice show indiscriminate binge-like eating of both sweetened palatable food and chow compared to BALB/cJ mice

Katie Sena

Advised by Camron D. Bryant, Associate Professor of Pharmacology and Psychiatry, MED

Binge eating disorder (BED) is defined as chronic episodes of consuming large amounts of food in less than 2 hours. BED poses a serious public health problem, as eating disorders are the second most lethal psychiatric disorder. Binge eating is a highly heritable trait; however, its genetic basis remains largely unexplored. Our lab employed a mouse model for binge eating that focuses on heritable inbred strain differences in acute and escalated intake of sweetened palatable food following limited, intermittent access that we compare with normal rodent chow. In the present study, we examined two genetically similar substrains of BALB/c mice in a palatable food (PF) binge-eating paradigm used to assess the escalation of palatable food consumption, food consumption after abstinence, and food consumption in the presence of adverse stimuli. BALB/cJ and BALB/cByJ mice showed comparable levels of acute and escalated consumption of palatable food across training trials. However, surprisingly, BALB/cByJ mice showed binge-like eating of chow pellets that was indistinguishable from palatable food intake across both substrains. Despite comparable levels of binge-like eating between sexes, male mice showed a greater increase in body weight compared to female mice. Finally, we replicated the well-documented differences in anxiety-like behavior between BALB/cJ and BALB/cByJ mice, which was followed by substrain-dependent effects on compulsive intake in the light/dark conflict test. To summarize, BALB/cByJ mice show indiscriminate levels of binge-like eating, regardless of presumed palatability. The promiscuity in binge eating across diets could be mediated by changes in novelty preference or seeking, or taste perception/processing.

545

5:30

Robosaw: The Collaborative Wood Stock Cutting Robot

Peter Siegel

Advised by Alan Pisano, Associate Professor of the Practice of Electrical and Computer Engineering

Construction workers at the jobsite performing the task of framing, assembling wooden structures that shape the interior and exterior of a building, face the risk of injury, most commonly from interaction with equipment, including circular saws, miter saws, and table saws. RoboSaw is a robot miter saw designed to eliminate the repetitive, time-consuming and potentially dangerous task of cutting dimensional lumber by automating the process. Using a computer vision system consisting of three cameras, RoboSaw can identify and perform cuts at intervals marked with a pen or pencil or cut wood based on a preset cut list autonomously. As a result, the construction worker can focus entirely on structure assembly, a task that is notoriously difficult for robots to accomplish by themselves, especially in unpredictable environments such as a jobsite. RoboSaw is capable of processing lumber up to 8ft in length and can cut a wide variety of lumber sizes at angles up to 52 degrees. Although RoboSaw is designed to cut wood without human intervention, to improve safety and usability it has a remote-control pendant that enables a construction worker to confirm, or skip marked cuts and shut off the robot from a distance in case of an emergency. By automating the processing of lumber at the jobsite, RoboSaw can improve construction speeds, eliminate the risks of injury, and reduce operating costs for employers and other stakeholders. At present, a fully functioning prototype of RoboSaw has been completed by our team. The robot is currently undergoing benchmarking against a conventional framing workflow to quantify how its use may impact the speed and efficiency of wood construction at the jobsite.

613B
11:30

Inciting Events: Exploring the Ties Between Media and Migration

Farah Sonde

Advised by Geoffrey Poister, Associate Professor of Television, COM

Inciting Events is a documentary I produced to understand why members of my family moved to the United States from India during the 1970s to 1990s. I focused on whether American media played a substantial role in drawing new migrants to the United States. The documentary consists of a series of filmed interviews that I conducted online and in person from 2021-2022. In these interviews, I asked my interlocutors about their reasons for migrating, as well as what American-based media they consumed before migrating. I compiled these interviews in order of the question answered to compare the answers given, and inserted photos and film clips to provide visual context to their lives in India and the American media they watched. A major finding of this study was that many members of my family did not expect to permanently move to the United States, but later found themselves staying in America due to marriage and other major life events. I also found that American media did indeed play a limited role in displaying the possibilities and freedom of America. However, contrary to my initial assumption that media depictions had a substantial effect on the decision to migrate, I have found that chain migration and word-of-mouth were even more significant drivers of migration. Overall, my findings are significant in reifying the importance of chain migration as opposed to media influence on migration choices and may serve as a basis point for which to evaluate new waves of migration in the age of the Internet and the increased globalization of media and knowledge.
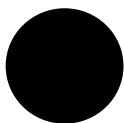
Small States at Odds: Understanding the Relationship Between the UAE, Qatar, and the Muslim Brotherhood

Riki Stout

Advised by Noora Lori, Assistant Professor of International Relations, Pardee

Despite being remarkably similar with regards to population, size, geography, and "small state" status, the United Arab Emirates and Qatar have developed a profound schism over the question of the Muslim Brotherhood and its role in both domestic and international affairs. While Qatar has maintained a position of neutrality and even cordiality towards the Muslim Brotherhood, the UAE has become one of its most outspoken critics and aggressive repressors since the 1990s. This study seeks to understand why this divide is occurring–I argue that geopolitics and small state behavioral theories are more effective for explaining the split than ideological/religious motives. This is supported through a media analysis of six major public press outlets from the UAE, Qatar, and Saudi Arabia (used for contextualization and comparison). Overall content was analyzed quantitatively, and articles were selected from key years for further qualitative analysis. This analysis found that the UAE has pursued a bandwagoning strategy with Saudi Arabia, whereas Qatar has opted to pursue a more independent strategy. These geopolitical and small state-related policy considerations are the major factors contributing to the divide over the Muslim Brotherhood.

545

11:30

Telemedicine in Hawaii's Pediatric Healthcare System: An Analysis of its Impact during the COVID-19 Pandemic

Trevor Tamura

Advised by Sophie Godley, Clinical Associate Professor of Public Health SPH

The COVID-19 pandemic has generated growing concerns around going to medical facilities in-person, forcing many healthcare systems to move toward a virtual approach to healthcare. Hawaii, which already had one of the most expansive policies in the country regarding telemedicine coverage, has had its various healthcare providers expand their existing services across the board in order to meet this new demand. The Hawaii Emergency Management Agency (HI-EMA) is currently the only group that has performed a statewide telemedicine assessment, providing a general overview from the beginning of the pandemic. This project focuses on pediatrics to understand how the increased usage of telemedicine throughout the COVID-19 pandemic has influenced the way pediatric care is delivered in Hawaii. Through accessible public health data, I focus on the role of health disparities over the past decade, such as the shortage of pediatric specialists in Hawaii, in developing the current state of youth healthcare. In conjunction with this data, I conducted interviews with five pediatric physicians to better understand their personal experiences using telemedicine in their practices. Though they comparatively used it to varying degrees, I discovered similar benefits, like easily treating rashes remotely, as well as drawbacks, like not being able to physically assess the child. The findings of this paper provide new insights into this modality of healthcare that has been taking place for the past two years and explore what else needs to occur to make it more effective and successful for patients and providers within Hawaii's pediatric healthcare system.

613A

3:15

BOXi

Khoa Tran

Advised by Alan Pisano, Associate Professor of the Practice of Electrical and Computer Engineering

Package theft is a prominent issue that is not addressed by any product on the market. BOXi fills this niche by serving as a smart lockbox that opens when a package is delivered and when the owner wishes to pick up a package additionally paired alongside a mobile app for real-time updates. A barcode scanner in the front of BOXi allows for delivered packages to be scanned and when verified, BOXi opens up for the items to be placed inside. A weight sensor detects changes in box contents and confirms package delivery. Meanwhile, BOXi will communicate with the mobile app so the user can open BOXi with a simple flick on a phone. BOXi will add to the connectivity of the modern world extending package tracking even up to when it is at the porch.

613A

11:45

Minute: An Accessible Technology Solution to Public Speaking Confidence

Andy Vo

Advised by Ziba Cranmer, Director of BU SPARK!, CDS

Public speaking confidence among American students and young adults is on the decline. The dearth of emphasis on presentation skills in the classroom has not only widened the divide between introverted and extroverted students and presenters but has also left rambling and the use of filler words unchecked. In this web application, I explore a technique that provides an accessible way for young adults to build public speaking confidence and skills. In my conversations, interviews, and surveys conducted with over 80 Boston University students, all participants noted that there was no known tangible solution other than practicing in front of a mirror or with friends. Furthermore, existing products require a paid subscription or virtual headset hardware that may discourage a potential user. In response, I designed and developed Minute, a web application that focuses on highlighting filler words and analyzes speech patterns in one-minute or untimed sessions where a user can opt for a randomly selected prompt or input their own. Building on a React.js platform, the application records a user's voice and transcribes the audio file using the AssemblyAI API, and is adjusted to pick up filler words. My team and I developed an algorithm alongside the Grammarly API to analyze disfluencies and suggest areas that could be improved. Within the span of a minute, a user can begin a snippet of a speech or presentation and get analytics on their speech patterns. To further build on these analytics, articles and TED Talks are recommended for the user to learn by example. The research and development of the web application offer a more accessible and feasible solution to current digital public speaking solutions that require in-app purchases or additional hardware. By providing interactive results and feedback, young adults can build a foundation of strong public speaking skills that can lead to growth in users, features, and other solutions similar to Minute.

613B

11:00

A Search for Dark Matter: Investigating Higgs Bosons Produced with Missing Momentum

Jackson Wallace

Advised by Indara Suarez, Assistant Professor of Physics, CAS

The inability to explain the phenomenon of dark matter remains one of the largest flaws of the Standard Model of particle physics. With increased particle collisions per second at the High-Luminosity Large Hadron Collider (HL-LHC) as well as the Phase-2 upgrade of the Compact Muon Solenoid (CMS) detector, the time is ripe to explore this mystery. This thesis gives an overview of current efforts to understand dark matter, with a focus on indirect searches for dark matter produced in association with a Higgs boson. This thesis then projects the sensitivity of the upgraded detector at the HL-LHC to dark matter. My study probed events where a Higgs boson decays to two bottom quarks with additional momentum not accounted for by the detector, a sign of dark matter. In particular, I used specialized machine learning algorithms to determine when large-radius jets in the detector originate from high-momentum Higgs bosons. The likelihood of these events is different in many extensions of the Standard Model, including the 2HDM+a model, which proposes two new particles. The model predicts a particle A, which decays into the Higgs boson and the other new particle, a, which then decays into dark matter. I simulated this model for an array of different masses of the two new particles. Using statistical analysis to compare the model to simulated background events, I project that, in the expanded data set of the HL-LHC, there will be no evidence of these two particles for many of the simulated masses. If observed, 2HDM+a particles with certain masses could have a significance near 5 standard deviations or greater. My projection study shows that the upgraded CMS detector offers an excellent opportunity to continue probing the nature of dark matter.

545

9:15

Thrust Vector Control of an Aerospike Rocket Nozzle via Aerodynamic Flow Manipulation

Liam Ward

Advised by William Hauser, Associate Professor of the Practice of Mechanical Engineering, ENG

The goal of this project is to analyze the feasibility of using secondary fluid injection (SFI) as a method of thrust vector control (TVC) for aerospike rocket nozzles. The aerospike rocket nozzle presents significant performance benefits over conventional converging-diverging (CD), or bell, nozzles. Despite these advantages, aerospikes are almost never selected for use in industry projects, owing to inherent challenges with their implementation and use in flight. One of these key challenges is controlling the thrust vector to maneuver the rocket. Thrust vector control is usually achieved by gimballing the rocket engines. Gimballing, or mechanically moving the engine and nozzle assembly to point the thrust in a desired direction, becomes structurally inefficient in the case of aerospikes. The aim of this project is to address this controllability problem by proving out thrust vector control via secondary fluid injection as a viable solution. Secondary fluid injection produces asymmetric thrust via the lateral injection of a fluid (gas or liquid) into a portion of the supersonic exhaust. A test stand was built to serve as a testbed for studying small-scale aerospike nozzles in the form of nitrogen cold gas thrusters. Next, an aerospike geometry was calculated and designed using Solidworks CAD software and modeled via computational fluid dynamics (CFD) using the Ansys Fluent software. 3D-printing was selected as the primary manufacturing method for simplicity and rapid iteration. The first testing campaign served to establish the test stand functionality and the nozzle's primary functionality of accelerating exhaust gasses to supersonic velocities, thus these first test articles did not include SFI capability. Having proven the architecture, the second testing campaign proved the functionality of SFI in providing TVC capability. Results from recorded force data showed that a significant lateral thrust to primary thrust fraction was achieved. These results provide evidence that SFI presents a viable solution to the inherent controllability challenge of aerospikes.

613B

2:00

Evaluation of Boston's Community Fridges as a Food Security Effort

Jessica Weber

Advised by Shelly DeBiasse, Clinical Associate Professor of Health Sciences, SAR

Food insecurity is a prevalent and complex issue within the United States. Various programs and policies have been implemented to combat food insecurity including food banks and pantries, social welfare, and free school lunch programs. A recent program to address food insecurity is the development of community fridges; public refrigerators and pantries located on sidewalks in front of businesses or organizations where neighbors can drop off or take food. Community fridges are a mutual aid effort that originated to fight food insecurity during the COVID-19 pandemic. Given their newness, there has been minimal research surrounding community fridges globally and none within New England. Using a mixed-methods study, we evaluated the use of community fridges in the greater Boston area. We centered our study on the following research questions: 1) What is the demographic make-up of individuals who use community fridges in the greater Boston area? and 2) Why do individuals living in the greater Boston area use community fridges? Researchers interviewed consenting adult users of community fridges using a pre-constructed survey that included general closed and open-ended questions as well as a validated 6-item food security screener. Participants who completed the survey received a $5 gift card for an affordable grocery store near the fridge. Fridge contents were also tracked and their nutritional quality analyzed. Demographic data and answers to closed-ended questions were analyzed and are presented descriptively. Open-ended, short answer questions were analyzed qualitatively for emergent themes with results presented as themes and quotes.

613A

5:45

Talking Talk: A Podcast about Rhetorical Complexity in Politics

Macy Wilbur

Advised by Beth Kramer, Senior Lecturer of Rhetoric, CGS

Rhetoric with higher levels of difficulty, usually meant for college students and academics, can limit the audience that is able to understand the content, although it can also follow strict, field-specific conventions which unify experts. On the other hand, rhetoric with lower levels of difficulty may not be specific enough to convey complex ideas despite being more accessible. The decision of which rhetoric level to use becomes even more important in political discourse and writing, as it is a field that impacts many people. It is important for academics and politicians to keep the general public informed and well-educated, but creating complex academic discourse is also a large part of the generic conventions instilled in many fields. In the form of three podcast episodes with interviews from rhetorical and political experts, I guide the listener through a few main concepts: if rhetorical complexity is necessary to invoke action, if political action is always the goal of political information, how to balance informational and emotional rhetoric in politics, and how rhetorical levels affect the way people receive and interpret political information.

613B

2:30

Spectroscopic Analysis of Truncated Tryptophan Hydroxylase Activity

Megan Wong

Advised by John Caradonna, Associate Professor of Chemistry, CAS

Tryptophan hydroxylase (TrpH) is a key enzyme involved in the synthesis of serotonin. TrpH is a member of the non-heme iron tetrahydrobiopterin-dependent monooxygenase family of enzymes, which includes phenylalanine hydroxylase (PheH) and tyrosine hydroxylase (TyrH). TrpH is the least characterized enzyme in this family; much of what we currently know is based primarily on the structural and sequence similarities among these three enzymes. The study of TrpH is clinically important because PheH and TyrH mutations cause phenylketonuria and Parkinson's disease, respectively. The main purpose of this project is to determine the regulation of TrpH using both kinetic studies and the known similarities within this enzyme family. We used a modified version of the enzyme (ΔTrpH) that has its proposed regulatory region removed, creating an enzyme that is constitutively active. This truncation would bypass any potential activation step involved in the TrpH reaction. We then developed a spectroscopic continuous enzyme assay to monitor the activity of ΔTrpH over time. This data is compared to previously determined rates of product formation. Our findings can be applied to other fields such as neuroscience experiments in brain tissue samples.

613A

5:15

Date-Night Meal Kit Business Plan

Jerica Xu

Advised by Nick Schiarizzi, Owner, Nick Schiarizzi Consulting

40% of people have experienced boredom while living with a significant other during the pandemic. Most couples experience a decline in their relationship quality as their relationship progresses because they become habituated to one another. Existing research shows that couples who spend more couple time together leads to higher levels of communication, sexual satisfaction and commitment. My project aims to use good food to revive romance through a date night meal kit business plan. The purpose is to deliver a high quality cooking experience directly to your home to help busy people overcome the challenges of planning date night. The product is a uniquely packaged meal-kit box designed for a couple to cook a meal together, creating a romantic and memorable date night experience. The ingredients are pre-measured and the recipe is included. The cooking experience is simplified so it can be prepared with minimal cooking supplies and skills. The business is called Table for 2 and it is aesthetically designed to have a high-end romantic feel to it with the use of rose and gray color schemes and cursive fonts. Distinctive designs, such as candles, wine, and personalized cards make the experience more intimate. Through a preliminary questionnaire I sent out, 78% of 110 respondents responded they were either very interested or somewhat interested in this product idea. Through my research, I identified that couples who go on date nights more frequently, who don't often cook, who work around 22-39 hours a week and have been dating 1-3 years demonstrate higher purchase intent. The 20-30 year old age range and middle to upper income group also correlated with higher purchase intent. The initial four meal kit options are a filet mignon steak, dumplings, sushi, and pizza, featuring authentic recipes that are true and tested. Customers can preorder these meal-kits off the website and they will then have them delivered to their door steps at a predetermined time. Sustainable packaging will also be a focus of this business. My final keystone project will be a 20 page business plan as well as a real prototype of the filet mignon meal kit.

Development and Assessment of a Manual Tracking Algorithm for Dense Reconstruction of Neurons Labeled Using Transgenic Zebra Finches

Young Ye

Advised by Ben Scott, Assistant Professor of Psychological and Brain Sciences, CAS

During tissue formation and renewal, cells migrate in a coordinated fashion. Studying this migration has crucial applications in a number of fields, including organismal development and adult neurogenesis. Cell migration can be visually captured using time lapse imaging methods, but translation of these images to quantitative data is a problem. Automated methods require large amounts of ground truth data to train and validate algorithms, necessitating an alternative approach to generate cell data. Here, we describe the development and evaluation of a manual tracking algorithm, which utilizes human trackers to reconstruct neuronal trajectories in volumetric time lapse datasets. This approach was applied to a 4D image dataset of densely labeled neurons and evaluated by comparison to existing data recorded using sparse labeling, and using a quantitative framework derived from perceptual decision making. The forebrain of a juvenile transgenic GFP-expressing male zebra finch was imaged in vivo to generate a densely labeled volumetric time lapse dataset. 17 neuron trackers were recruited to track neurons using several different methods. Factors such as training method and the type of neuron tracked affected the quality of data generated by this approach. There was a large variability in the data produced by different trackers. However, by pooling and taking the union of multiple novice trackers, we were able to generate data comparable in accuracy to that of an expert. A consensus dataset of 52 neuron trajectories was generated by this method, and migratory neuron characteristics are comparable to data in existing literature on neuronal migration.

613B

11:45

Assessing Orangutan Habitat Quality and Conservation Value of a Secondary Forest within Gunung Palung National Park, Borneo, Indonesia

Victoria Zdanowicz

Advised by Cheryl Knott, Professor of Anthropology, Biology, and Women's Gender and Sexuality Studies, CAS

In the lowlands of southeast Asia, the island of Borneo faces rates of primary forest degradation and deforestation exceeding the rest of the world's tropical forests. For critically endangered Bornean orangutans (Pongo pygmaeus wurmbii), habitat loss greatly threatens the long-term stability of their remaining populations. About 75% of all wild orangutans live outside protected areas, and yet there is a significant gap in the literature regarding how Bornean orangutans utilize such habitats. With rates of forest loss and fragmentation projected to rise, there is a need to expand our understanding of orangutan spatial ecology in human-modified habitats to better inform conservation efforts. My project addresses this gap by investigating differences in orangutan habitat quality within the Gunung Palung National Park (GPNP) landscape, in Borneo, Indonesia, specifically focusing on the potential conservation value of a secondary forest with a history of intense logging. The Gunung Palung Orangutan Conservation Project has collected data on wild orangutans and the surrounding primary forest for almost three decades. The team recently began systematically collecting data on the local vegetation and orangutan presence in the nearby secondary disturbed forest. For my project, robust census and phenology data from both sites were used to characterize forest quality, focusing on the abundance and density of orangutan feeding trees and trends in habitat structure. Orangutans in GPNP flexibly inhabit a range of habitats within the primary forest, suggesting that the nearby degraded forest could provide population support if sufficient orangutan foods are available. Preliminary analyses revealed typical orangutan foods within the secondary forest, as well as a disproportionate percentage of invasive species which orangutans are suspected to eat. This preliminary research elucidates the under-researched role of forest recovery on the long-term conservation and survival of Bornean orangutans across a regional matrix of habitat type and quality.

545

2:30

Elephant Edu — A Family-based Sexuality Education App

Ji Zhang

Advised by Sophie Godley, Clinical Associate Professor of Public Health, SPH

Sex is a taboo word in China. I received my very first sexual health education when I was 18 to meet the requirement for Boston University's required sexual misconduct training. By that time, I had already missed the optimal window for sex education, which is shown to be between 9 to 12 years old. There are neither required sexual health education classes in most elementary and middle schools nor sexual misconduct training in most colleges in China. Instead, parents seem to be the primary source of sex education. However, according to research conducted by the United Nation Population Fund, most parents refrain from having this important conversation with their children out of embarrassment. As such, when the news of ten sixteen-year-old girls being sexually abused by a celebrity came out in 2021, I came to the conclusion that it is now more important than ever to normalize the idea of sex education among parents and their preteen children. Taking into account the increasing use of mobile phones in China, it is highly feasible to develop an online platform which teaches parents how to provide at-home sexual education. This project designs the interface of a family-based sexuality education mobile application in a Figma design file. In the future, my project could be the basis for a much-needed sexual health educational app in China.

613A

9:15

ACKNOWLEDGMENTS

This symposium, the culmination of four years of living and learning in the Kilachand Honors College, would not have been possible without key support from numerous individuals.
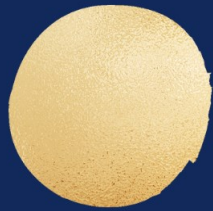
We would like to thank the people responsible for keeping Kilachand Honors College running for their tireless work on our behalf throughout the past four years. We would like to especially thank Amanda Shalian, Rick Tonetti, and Megan West Kagstrom for their efforts in actually bringing this symposium into existence. We are grateful for Carrie Preston, Linda Doerrer, and Joanna Davidson for your leadership and direction of this community. We would like to thank Taryn Craig, Eric Lopez, Daniel Hoffman, and Kyle Campogna for their advice and guidance in these four years.

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We are grateful for the work of our Keystone advisors in patiently guiding our projects to success. Without them, we would not be able to proudly present our work today.

Finally, we would like to thank everyone who was able to attend this symposium today. We hope that you felt buoyed as we did by seeing the wealth of knowledge on display in-person today.

-The Kilachand Honors College Class of 2022