SYMPOSIUM BOOKLET

The 21st Annual
Chicago Area Undergraduate Research Symposium

Saturday, April 19th, 2025

Robert H. Lurie Medical Research Center
Chicago, Illinois

DePaul University | Illinois Institute of Technology | University of Illinois Chicago

Loyola University | Northwestern University | University of Chicago

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EVENT SCHEDULE

9:00-10:00 AM	**Registration** *South Entrance*
9:30-9:45 AM	**Judge Orientation** *Baldwin Auditorium*
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10:00AM-11:20AM	**Oral Presentation Panel I** *Baldwin Auditorium*
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12:45*PM-2:00 PM	**Lunch** **Keynote Speech** *Hughes Auditorium* **If you have a dietary restriction, please prioritize grabbing your lunch on the earlier side*
2:00-4:00 PM	**Poster Session Continues** *In Various Atriums*
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5-6 PM	**Awards Ceremony** **Closing Remarks** *Hughes Auditorium*

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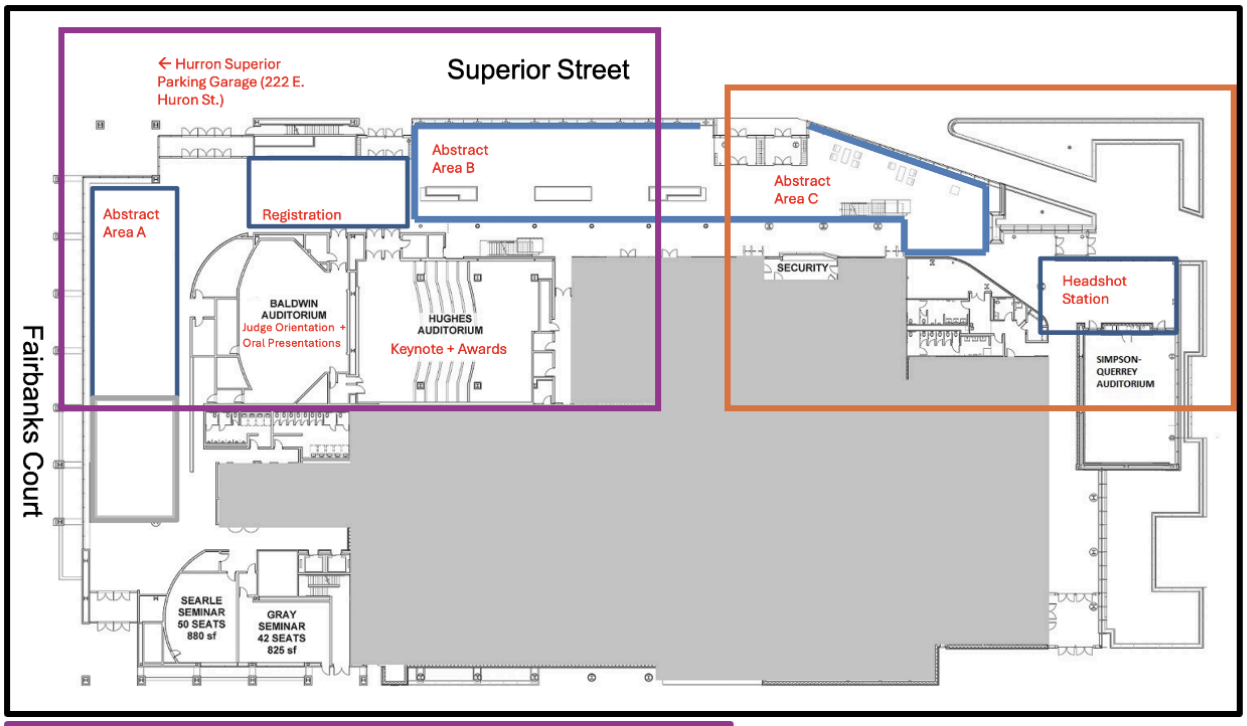

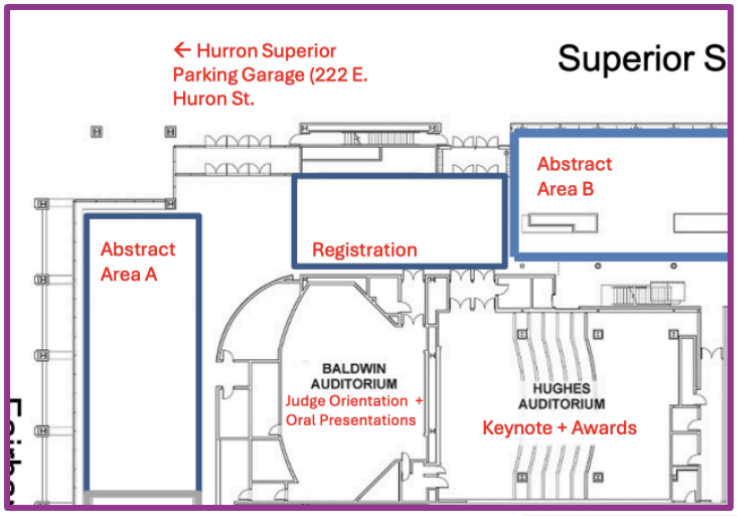

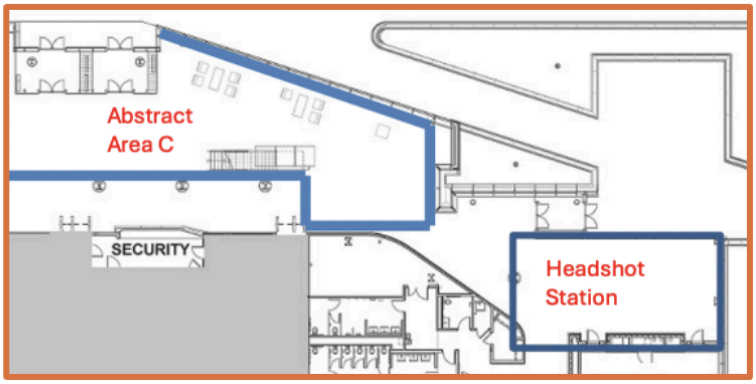

Dearest attendees,

On behalf of the Inter-School Board, I am so excited to welcome you to the 21st Annual Chicago Area Undergraduate Research Symposium!

This year, we've been blown away by the incredible number of presentation applications we've received from undergraduate students across the region. It's truly inspiring to see how committed and passionate these researchers are in their respective fields, and it reaffirms that the next wave of innovation and discovery is in great hands.

We've made some exciting updates to this year's event to offer even more opportunities for engagement and networking. Alongside the impressive lineup of over 150 poster presentations, we're thrilled to have a professional photographer on site for headshots, ensuring that all our presenters and attendees can leave with a polished, professional portrait. In addition, we've organized interactive booths from multiple Chicagoland institutions, where you can learn more about the work they're doing, connect with their representatives, and explore opportunities in your field.

We are especially honored to welcome Dr. Melina Hale, William Rainey Harper Professor and Dean of the College at the University of Chicago, as our keynote speaker. A pioneering researcher in neurobiology and biomechanics, Dr. Hale investigates how animals sense and respond to their environments, with current work exploring neural circuits and the neuromechanics of aquatic animals—including the remarkable cephalopods. Beyond her lab, Dr. Hale is a passionate advocate for undergraduate research and has led initiatives to creatively integrate research experiences into undergraduate education. We're excited for the unique insights she'll bring to our symposium—from scientific inquiry to institutional leadership.

I would also like to take a moment to express my heartfelt gratitude to the exceptional team of the Inter-School Board. Their tireless dedication and creativity have made this symposium possible, and I can't thank them enough. A huge thank you as well to our partner universities and staff who have supported us in making this event a reality. We couldn't have done it without the collaboration of Dr. Peter Civetta and Ms. Tori Saxum at Northwestern University, Dr. Lauren Miller at DePaul University, Dr. Kevin Kaufmann at Loyola University, and Dr. Carlo Segre from the Illinois Institute of Technology.

Thank you all for your participation and your commitment to advancing research in our community. I hope you enjoy the symposium and make meaningful connections that inspire your next big idea.

We applaud and thank you,
Sophia Bonfigli
CAURS 2025 Director

CAURS CHICAGO AREA UNDERGRADUATE RESEARCH SYMPOSIUM

KEYNOTE DIALOGUE

Dr. Melina Hale, PhD

William Rainey Harper Professor of Organismal Biology and Anatomy, University of Chicago Dean of the College, University of Chicago

Dr. Hale is an active academic researcher and also serves in University of Chicago leadership as the Dean of the College (since 2023). She sees research experience as an outstanding learning opportunity for undergraduates and some of the most impactful teaching opportunities for faculty. At UChicago, she is working to expand research opportunities for students and creatively integrate research into curricula.

In her laboratory, Dr. Hale studies neurobiology and neuromechanics. Her focus is neural circuit organization and understanding how sensation of the environment impacts an animal's movement and behavior. Her current work is funded by the Office of Naval Research and aims to understand aquatic organisms to inform the design of engineered devices.

Although Hale's research experience began with lemur behavior and focused intensively in the zebrafish genetic model, she also has explored a diversity of study organisms. Of particular focus at present are the remarkable cephalopod species, octopuses and their relatives, that demonstrate stunning, novel morphologies and abilities to perform sophisticated behaviors. Cephalopods have large brains and nervous systems but arose from much simpler organisms, clams and their relatives. Thus, they provide a comparative example to humans and other vertebrate animals on how to build a brain and design a body.

Dean Hale received her BS from Duke in 1992 and PhD from UChicago in 1998 and joined the faculty in 2002. Hale was a National Academies/Howard Hughes Medical Institute Education Fellow and a Fellow of the Institute for Defense Analysis and received a National Science Foundation CAREER award. She served as interim director of the Marine Biological Laboratory (Woods Hole, MA) and has had various leadership roles at UChicago. She is a Fellow of the American Association for the Advancement of Science. At UChicago she has received a Wayne C. Booth Graduate Student Prize for Excellence in Teaching and the University's Faculty Award for Excellence in Teaching and Mentoring.

ORAL PRESENTATION SCHEDULE

Panel I. Seeing Ourselves: Identity, Representation, and Cultural Perception
10:00AM - 11:20AM

Marion Caffey, University of Chicago
Title: The Reality of Representation: Social Media Effects on Self-Esteem and Social Comparison Across Race and Gender
Discipline: Psychology

Aashna Rai, Northwestern University
Title: "To be A Loudmouth American Woman": South Asian American Mothers, Cultural Resistance, and Theatrical Disruption
Discipline: Humanities and Fine Arts

Binhao Wu, Northwestern University
Title: Ethnic-Racial Identity Content and Perception of East Asians as an Ingroup vs. Outgroup
Discipline: Psychology

Judah Huberman-Shlaes, University of Chicago
Title: Neural Mechanisms of Generalized Visual Perceptual Learning
Discipline: Psychology

Panel II. Unraveling Molecular Mechanisms: From Cells to Systems
11:30AM-12:50PM

Yushan Li, University of Illinois at Urbana-Champaign
Title: Quantifying Oligomerization States of Optogenetic Proteins VfAuLOV and AtCRY2 Within Cells
Discipline: Biochemistry, Biophysics, Cellular and Molecular Biology

Alex Gerber, Northwestern University

Title: Investigating the Effects of Crosslinking and Catechol-Mediated Interactions on the Mechanical Properties of Mussel Foot Protein 5
Discipline: Engineering

Nivedha G. Krishnan, University of Illinois at Chicago
Title: Unique and Redundant Roles of Notch1 and Notch4 in Retinal Angiogenesis
Discipline: Genetics and Developmental Biology

Cooper W. P. Stringer, Northwestern University
Title: Unconventional Trafficking of a Novel Amphipathic Alpha-Helical Peptide During Drosophila Oogenesis
Discipline: Cellular and Molecular Biology, Genetics and Developmental Biology

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Panel III. Fractals, Fields, and Foundations: Explorations in Math and Physical Science
2:00PM-3:20PM

Delaney Rager, Loyola University
Title: Exploration of Modifications to Markov Chains Constructing Fractal-like Patterns
Discipline: Mathematics

Dax Kay, Northwestern University
Title: Instrumentation for Cross Correlation Measurements and Johnson Noise Thermometry
Discipline: Inorganic Chemistry, Medicinal Chemistry and Pharmacognosy

Amal Alwatik, Illinois Institute of Technology
Title: Design of SHEL-B: The Spherical Hopping Eccentrically Loaded Bot
Discipline: Engineering

Arthur Costa, University of Chicago
Title: Efficient Nucleotide Loading and Non-enzymatic Primer Extension in Model Protocells Facilitated by Modular and Dynamic Alterations to Nucleotide Permeability
Discipline: Chemical Biology

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ORAL PRESENTATIONS

Panel I. Seeing Ourselves: Identity, Representation, and Cultural Perception

1. The Reality of Representation: Social Media Effects on Self-Esteem and Social Comparison Across Race and Gender

Marion Caffey, [a] Dr. Jon E. Grant, [b] Dr. Kyshia Henderson
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Extensive research on women establishes social media's detrimental effects on self-esteem and social comparison, mainly focusing on body image [1]. Research on social media effects also extends to people of color, focusing on stereotypes and online discrimination [2]. Yet, there is a gap in the literature on the intersectionality of race and gender on these mental health effects. Here, we examine how this intersectionality compounds rates of negative self-esteem and high social comparison. To test alignment with racial category, 30 Black, Asian/Pacific Islander, and White women completed a Mock Social Media (MSM) trial, tracking choice of images within and outside of their race in the experimental and images without women in the control, and a Social Media Habits Survey asking about general habits and following of accounts in their racial category. To test self-esteem and social comparison, participants completed a pre-test/post-test State Self-Esteem Scale [3] and a post-test only Social Comparison Survey. Results supported our hypotheses that women are drawn to images that align with their race, self-esteem decreases and social comparison increases following seeing images that align with one's race and gender, and women of color are at higher risk of these self-esteem and social comparison changes. These results support the need for additional studies that focus on compounding mental health effects correlated with the intersectionality of marginalized identities like race and gender. Further study may work to inform policy on online platform design to mitigate negative mental health effects and help better serve the needs of marginalized identities in everyday online use.

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[1] Perloff, R.M. Social Media Effects on Young Women's Body Image Concerns: Theoretical Perspectives and an Agenda for Research. *Sex Roles* 71, 363–377 (2014). https://doi.org/10.1007/s11199-014-0384-6
[2] Rowan-Kenyon, H. T., McCready, A. M., Barone, N. I., & Martínez Alemán, A. M. (2022). Does Experiencing Racialized Aggressions on Social Media Influence Perceptions About the Campus Racial Climate?. *Research in higher education*, *63*(4), 610–630. https://doi.org/10.1007/s11162-021-09662-8
[3] Heatherton, T. F. & Polivy, J. (1991). Development and validation of a scale for measuring state self-esteem. Journal of Personality and Social Psychology, 60, 895-910.

2. Neural Mechanisms of Generalized Visual Perceptual Learning

Judah Huberman-Shlaes[1]**,** Felix Noble[2], Colby Lundak[1], Gabriel Rodriguez[1], Shannon Heald[1], and *Howard Nusbaum[1]
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Prior research has demonstrated differences in the degree of improvement in one's ability to track multiple objects [1]. Here we examined individual differences in neural responses to generalized learning in an adaptive multiple object tracking task using electroencephalography (EEG). Analysis of visual evoked potentials revealed that activity during the N1 period predicted individual differences in perceptual learning. These findings suggest the ability to improve one's visual perceptual skill in a generalized manner relies on attentional mechanisms that selectively modify visual processing sensitivity. This finding mirrors neural mechanisms for generalized learning in the auditory domain [2], suggesting a common mechanism for generalized perceptual learning across sensory modalities.

References:

[1] Dale, G., Cochrane, A., Green, C.S. (2021) Individual Difference predictors of learning and generalization in perceptual learning. *Attention, Perception, and Psychophysics, 83,* 2241-2255

[2] Heald, S.M., Van Hedger, S.C., Veillette, J., Reis, K., Snyder, J.S., Nusbaum, H. (2022) Going Beyond Rote Auditory Learning: Neural Patterns of Generalized Auditory Learning. *Journal of Cognitive Neuroscience, 34*(3), 425-444

3. Ethnic-Racial Identity Content and Perception of East Asians as an Ingroup vs. Outgroup

Binhao Wu[a] and *Wendi Gardner[b]
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Existing research on ethnicity-/race-based person perception has primarily focused on out-group processes, documenting in-group favoritism in perception. This study supplements this corpus by incorporating research on ethnic-racial identity (ERI) and in-group perception. It investigates (1) whether the way people construct their ERI (i.e., ERI content) influences their perception of others in ethnic-racial terms and (2) whether the same ethnic-racial group is perceived differently by its in-groups vs. out-groups. Participants (N = 311) of either East Asian or White descents completed four tasks through Qualtrics: (1) reporting of their ERI content; (2) the reverse correlation task (RCT), where they were presented with black-and-white, blurry images in pairs and were asked to choose one that better resembled the target ethnic-raical group East Asian, for 300 trials; (3) a description judgment task (DJT), where they were presented 30 culturally relevant and 30 culturally irrelevant traits or behaviors of an unknown, mixed-East Asian person, and they indicated whether each of the 60 descriptions made the target any more or less East Asian on a five-point scale; and (4) open-ended questions about their day-to-day perception process of in-groups and how they construct their group boundaries. Analyses were compared participants across two types of groups: ERI content groups (ascribed vs. hybrid vs. acquired) and ethnic-racial groups (in-group/East Asian vs. out-group/White). Preliminary findings demonstrated a nuanced relationship: (1) no visually meaningful differences emerged in the mental images from the RCT across both groups of interest; (2) differences in the DJT emerged across ethnic-racial groups but not across ERI content groups; and (3) open-ended responses differed across both group lines. These findings suggest that while the experiential knowledge of being an in-group member may influence cultural and narrative understanding of the group, neither ERI content nor in-group membership influences the automatic process of perception.

4. “To be A Loudmouth American Woman”: South Asian American Mothers, Cultural Resistance, and Theatrical Disruption

Aashna Rai[a]
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The South Asian American mother occupies a place of middle-ness, traversing paths between convention and contemporary; love and loss; and, heritage and healing. However, through the transformations of physical, intellectual, and cultural place that accompany geographical migration, immigrant women use performances of the South Asian American present to actively challenge and reconstruct the ideals of desi motherhood and American assimilation. As artists, they grapple with their self-presentation as physical, feminized subjects onstage and carefully craft elements of performance such as production, script, and dialogue to reclaim their narrative and be perceived on their own terms.

In this paper, I examine the character of Kirtana in Han Ong’s play *Swoony Planet* and comedian Zarna Garg in her solo comedy special *One in a Billion* as social, physical, cultural, and theatrical acts—inseparable from their context of the South Asian American diaspora, models of immigrant acculturation and behaviour, and the politics of intersectional, postcolonial, and global south feminisms. Drawing connections between Takaki’s “community of memory” [1], Khubchandani’s critical aunty studies [2], and Lee’s sites of collective formation [3], I argue that the artists’ use of physical embodiment and geography, the ‘aunty’ persona, representations of self-identity within domestic spheres, vocal expression and linguistic agency, and maternalism dismantle the culture of silence and subservience around South Asian American motherhood, reconstructing the character of the desi immigrant mother as an active performer of sociocultural community and transformation. I therefore present modern performances of immigrant motherhood as a disruptor of systems of cultural assimilation and capitalist patriarchy, where the theatrical-political actor facilitates a collective form of political resistance for current and future generations of immigrant women.

References

[1] Takaki, Ronald. Strangers from a Different Shore. Little, Brown, 1989.
[2] Khubchandani, Kareem. “Introduction: Transnational figurations of the South Asian Aunty.” South Asia: Journal of South Asian Studies, vol. 46, no. 1, 2 Jan. 2023, pp. 71–94, https://doi.org/10.1080/00856401.2023.2164414
[3] Lee, Josephine. Performing Asian America: Race and Ethnicity on the Contemporary Stage. Temple University Press, 1998.

Panel II. Unraveling Molecular Mechanisms: From Cells to Systems

5. Quantifying Oligomerization States of Optogenetic Proteins VfAuLOV and AtCRY2 Within Cells

Yushan Li[a], Tyler Camp[a], Zixiao Li[a], and *Kai Zhang[a]
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Quantifying protein oligomerization states is important in understanding the relationship between protein oligomerization and cell signaling outcomes. Optogenetic proteins, when fused to proteins of interest, avoid the confounding ligand binding step and allow precise regulation of signaling using blue light. However, the oligomerization states of optogenetic proteins within cells remain unknown. Vaucheria frigida Aureochrome light-oxygen-voltage (VfAuLOV) and Arabidopsis thaliana Cryptochrome 2 (AtCRY2) are two optogenetic proteins that undergo blue light-dependent oligomerization in cells. To study their oligomerization states, we fused the HaloTag ligand to VfAuLOV and AtCRY2 and stained the cells with organic fluorophore JF549. We then used the fluorescence fluctuation spectroscopy (FFS) method and photon counting histogram (PCH) analysis to quantify their degrees of oligomerization following blue-light stimulation. Our findings confirm that VfAuLOV dimerizes in cells [1], while AtCRY2 dimerizes and then tetramerizes upon blue light activation. Additionally, we found that the constitutively active W374A mutant of AtCRY2PHR has higher basal activity than WT in dark conditions. This study enhances the quantitative understanding of protein oligomerization and expands the potential applications of photoactivable proteins in controlling signaling pathways.

References

[1] Nakatani, Y., & Hisatomi, O. (2015) Molecular mechanism of Photozipper, a Light-Regulated Dimerizing module Consisting of the bZIP and LOV domains of Aureochrome-1. *ACS Biochemistry*, *54*(21), 3302–3313.

6. Unconventional Trafficking of a Novel Amphipathic Alpha-Helical Peptide During *Drosophila* Oogenesis

Cooper W. P. Stringer,[a] Kevin G. Nyberg,[a] and *Richard W. Carthew[a]
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Recent advancements in technology have revealed an understudied class of peptides, translated from short open reading frames (sORFs), that are becoming increasingly appreciated for their roles in development and disease. Dafcin, a conserved peptide recently discovered in *Drosophila melanogaster*, is translated from one such 63 nucleotide sORF expressed during oogenesis. Dafcin is predicted to form a 21 amino acid amphipathic alpha-helix; similar peptides in nature include vesicle curvature sensing proteins, viral fusion peptides, and cell-penetrating domains, all notable for interacting with lipid membranes. A Dafcin-GFP fusion protein, generated using CRISPR/Cas9 at the endogenous *Dafcin* locus, is secreted from the ovarian follicle cells and imported into the oocyte via endocytosis of membrane-bound yolk vesicles. However, the particular Dafcin trafficking mechanisms are still unclear, as is whether this process is generalizable to other tissues. To investigate these, I have designed a transgenic *Drosophila* line with the Dafcin-GFP fusion protein under control of an inducible promoter. The ability to control the level and timing of Dafcin-GFP expression enables comparative uptake measurements using confocal microscopy. Surprisingly, when this transgene was tested in the ovarian follicle cells, Dafcin-GFP uptake into the oocyte did not scale with expression levels in the follicle cells. Preliminary experiments suggest this is due to limitations in the rate of secretion of Dafcin-GFP, rather than in the rate of uptake. Follicle cells expressing GFP with a canonical N-terminal signal sequence, conversely, showed much higher secretion, suggesting that Dafcin does not move through the classical secretory pathway. To clarify Dafcin's trafficking, I will use the transgene to express Dafcin-GFP in other secretory systems, starting with the larval imaginal wing discs. These results will inform how the secretion and uptake of small peptides, including many important to human health, are controlled in the absence of signal sequences or other common regulatory features.

7. Investigating the Effects of Crosslinking and Catechol-Mediated Interactions on the Mechanical Properties of Mussel Foot Protein 5

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Mytilus galloprovincialis (the Mediterranean mussel) produces mussel foot protein 5 (fp5), which has extraordinary strength, adhesion, and cohesion properties that allow for adherence to a variety of underwater surfaces [1]. A better understanding of fp5 and its properties aids in its use in biocompatible and biodegradable synthetic materials, such as hydrogels and adhesives to promote wound healing at surgical sites [2]. Several chemical and physical aspects of the protein have been attributed to fp5's unique properties, however, the full extent of sequence and molecular contributions to fp5's function are not fully understood. Tyrosine (comprising 20 of fp5's 76 amino acids) plays a critical role, as it can form crosslinks as well as be post-translationally modified to 3,4 dihydroxyphenylalanine (DOPA). The extent of crosslinking alters the mechanical properties of the protein, and DOPA plays a critical role in fp5's adhesive properties. This project uses molecular dynamic (MD) simulations to investigate the effects of these modifications by comparing the mechanical properties of fp5 systems with unmodified tyrosine, tyrosine converted to DOPA, and tyrosine converted to DOPA dianion (a reduced form), each at both 0% and 40% crosslinking densities (the portion of total tyrosines crosslinked in the system). Simulated uniaxial tensile tests on each system were performed to obtain stress strain curves from which the mechanical properties were analyzed. While the tyrosine and DOPA systems had similar toughnesses and elastic moduli at both 0% and 40% crosslinking, DOPA dianion demonstrated an enhancement in these properties. Further analysis revealed DOPA dianions can form a variety of coordination complexes with the trivalent iron in solution (including between proteins), which may account for this discrepancy. This work improves the understanding of the molecular interactions of fp5 and how parameters (such as crosslinking and post-translational modifications) can be utilized in developing synthetic materials with enhanced mechanical properties.

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[2] Zhao, H., & Waite, J. H. (2006). Linking adhesive and structural proteins in the attachment plaque of Mytilus californianus. *The Journal of Biological Chemistry*, *281*(36), 26150–26158

8. Unique and Redundant Roles of Notch1 and Notch4 in Retinal Angiogenesis

Nivedha G. Krishnan,[a] Christie Kang,[a] Taliha Nadeem,[a] Braulio Aguilar,[a] Krishna Thakkar,[a] L. A. Naiche,[a] *Jan K. Kitajewski[a,b]
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Angiogenic processes are involved in normal development, inflammation, wound healing, and metastasis. Notch signaling plays a critical role in the mediation of angiogenesis. The angiogenic role of Notch1 has been extensively studied, whereas the impact of Notch4 regulation on the vasculature is poorly understood. Our lab has determined that the loss of Notch4 during retinal developmental angiogenesis is anti-angiogenic, characterized by reduced radial outgrowth of vessels and decreased vessel density, in contrast to the loss of Notch1, which results in hypersprouting and increased vascular density. However, the structural similarity and common transcriptional targets of Notch1 and Notch4 suggests they may have overlapping functions that are not evident until both genes are removed. We hypothesize that Notch1 and Notch4, while distinct in their roles as angiogenic regulators, have redundant proangiogenic impacts. We therefore expect to see a more severe reduction in vascular development if both signaling pathways are hindered. To investigate the distinct and overlapping roles of Notch1 and Notch4, we generated mice with endothelial-specific knockouts of Notch1 (Notch1ECKO), Notch4 (Notch4ECKO), or both genes (Notch1Notch4ECKO). We harvested retina from mice at postnatal days (P)5, P10, and P12 to analyze retinal vasculature in the superficial and deep plexus. Harvested retina were stained for IsolectinB4 to identify vasculature, Iba1 to identify microglia, and ESM1 to identify tip cells. Retina were analyzed for vascular growth measurements, including density, outgrowth, and tip cell counts. Quantitative analysis of the P5 retina showed a highly abnormal double mutant Notch1Notch4ECKO phenotype characterized by a significant reduction in radial outgrowth, significant increase in tip cell density at the vascular front, and a trend toward diminished vascular density near the center of the retina. Ongoing analysis is defining changes unique to Notch4ECKO, Notch1ECKO, and Notch1Notch4ECKO at multiple stages to clarify each gene's individual function in angiogenesis.

Panel III. Fractals, Fields, and Foundations: Explorations in Math and Physical Science

9. Exploration of Modifications to Markov Chains Constructing Fractal-like Patterns

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It is well known that the Sierpinski triangle fractal can be generated through many iterations of the Chaos Game (CG). The CG is a random, iterative process with a deterministic end pattern of the Sierpinski triangle. The beginning of the CG starts with a random starting point and three vertices of an equilateral triangle placed on a graph. For the first step, a random vertex of the triangle is chosen, and a second point is placed at the midpoint between the random vertex and the starting point. The new point becomes the new starting point and the process of randomly choosing a vertex and placing a point midway between the two is iterated many times. Modifications to parameters of CG can be made to generate interesting end fractal patterns. The CG Representation is the same process applied to genomic models and has been used qualitatively to analyze differences in genomic sequences in the field of biology [1]. This project focuses on the construction of fractal images. We build a stochastic transition matrix that represents the transformation of one step to the probabilistic outcome of the next. Since there is a deterministic ending, regardless of the starting coordinate vector in the CG, the transition matrix stabilizes after an adequate number of steps. This is a well-known property of Markov Chains; thus, we can raise the matrix to a high power to generate the end fractal pattern. Manipulation of the parameters of the CG including changing the number of vertices or changing how far each step sends the current point, constructs intriguing fractal-like patterns. When the parameters are manipulated, and the eigenvalues of the corresponding transition matrices are calculated, the eigenvalue plots on the complex plane led to fascinating results when correlated with the transition matrix and the end fractal-like pattern.

References

[1] Löchel, H. F., & Heider, D. (2021). Chaos game representation and its applications in bioinformatics. *Computational and Structural Biotechnology Journal, 19*, 6263–6271. https://doi.org/10.1016/j.csbj.2021.11.008

10. Instrumentation for Cross Correlation Measurements and Johnson Noise Thermometry

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There has been growing interest in superconductors because of their unique material properties, such as their ability to conduct electricity with zero loss, expel magnetic fields, and support nonlocal interactions. Crossed Andreev reflection and elastic cotunneling describe two such nonlocal interactions where two spatially separate electrons communicate faster than the speed of light to form a pair of electrons in the superconductor. It remains an active question how we quantify the prominence of these two interactions, especially given their rarity in comparison to other interactions in the superconductor. Our lab seeks to answer this question utilizing cross correlation measurements. Cross correlation is the method of averaging two distinct signals to extract a common component. As such it may be used to identify signatures of nonlocal transport. Additionally, the lack of an accurate, drift-free thermometer at low temperatures presents a significant challenge for this and other experiments. Johnson noise, arising from inherent thermal fluctuations of electrons, provides a primary measure of temperature, making it the perfect basis for a drift-free thermometer. I propose a Johnson noise thermometer that will utilize cross-correlation analysis of signals from our homemade low-noise amplifiers to extract a temperature measurement. Moreover, this experiment will develop the protocol for future nonlocal transport measurements. The experimental task of measuring small signals at low temperatures requires highly specialized instrumentation. The most significant of which is the fabrication of a low noise, high speed instrument amplifier with characteristics not commercially available. My current amplifiers have demonstrated promising frequency and time series response in various circuit simulations via SPICE software, and have been successful in preliminary performance tests. My successful construction and validation of the Johnson Noise thermometer will not only establish a reliable temperature measurement tool crucial for low temperature experiments, but also provide the framework for nonlocal transport measurements.

11. Design of SHEL-B: The Spherical Hopping Eccentrically Loaded Bot

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In this project, we aim to explore the eccentrically loaded hopping hoop problem in order to create a jumping robot without legs. The ultimate goal of the project is for the robot to be able to roll, jump, and control its motion in the air. The possibility of a hopping hoop (initially proposed by John E. Littlewood [1]) has long been under mathematical scrutiny. It entails a near-massless hoop having a point mass attached at the edge, rolling with a sufficiently high velocity that would cause the hoop to jump without any external forces. Ultimately, it was proven by Tadashi Tokieda [2], and validated in our own experimentation, that it is in fact possible, but with a set of very precise criteria: a large ratio of the point mass to the hoop, a high transversal and rotational velocity, and the release of the point mass at a specific angle which creates a larger angular momentum. In the beginning of this project, we intended to create a cylindrical-shaped robot in which the driving force is a motorized pendulum, inspired by the robot created by Jake Buzhardt et al. from Clemson University [3]. Throughout the design iterations, we leaned towards a spherical robot which utilizes a system of three rings.

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12. Efficient Nucleotide Loading and Non-enzymatic Primer Extension in Model Protocells Facilitated by Modular and Dynamic Alterations to Nucleotide Permeability

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Oleic acid membranes capable of encapsulating self-replicating RNA present a model protocell to study the origin of life. In this model, RNA functions as both the primary carrier of genetic information and the primary catalytic macromolecule. Loading these protocellular vesicles with activated nucleotide analogues is necessary to facilitate primer extension and RNA copying chemistry which would be needed for the development of early RNA-based life. Still, loading nucleotides remains a challenge due to their exceedingly low permeability through fatty acid membranes. Using shrink/swell assays and A260 absorbance-guided size-exclusion chromatography, we measured the permeation rates of nucleotides into and out of vesicles under many different conditions, including various buffer compositions, salt concentrations, membrane compositions, temperatures, and isoprenoid and formamide concentrations. Combining the conditions that most increased nucleotide permeability, we created a system capable of transiently and semi-selectively increasing nucleotide permeation rates up to 12,000 times greater than baseline. We then used this system to rapidly load activated nucleotides into protocells. We are now working on continuous-flow experiments that show that by washing away isoprenoids and decreasing temperature, we can drastically slow nucleotide leakage after loading. We are also using P31 NMR to show that this increased permeation allows for the efficient formation of encapsulated bridged dimers that do not leak at an appreciable rate, allowing for continued primer extension and copying after loading.

POSTER PRESENTATIONS

1. The Role of Hypoxia-Induced Gene Expression and Their Organization Around Nuclear Speckles in Breast Cancer Cells

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In breast cancer tumors, abnormal new blood vessels cannot sustain an adequate blood supply, creating a hypoxic environment. This environment modifies surrounding gene expression levels, and hypoxic signaling interacts with cellular pathways to contribute to cancer progression. However, the response to spatial and functional reorganization of genes within the nucleus remains poorly understood. Nuclear speckles, sub-nuclear domains rich in splicing factors and RNA processing proteins, regulate gene expression. Splicing factors SON, SRRM2, and SRSF1 are critical for alternative splicing, while chromatin regulatory proteins CTCF and cohesion subunit Rad21 impact gene organization and regulation. Although nuclear speckles are known to influence gene expression under various conditions, research on their role in hypoxia-induced gene expression remains limited. This knowledge is significant given hypoxia's importance in breast cancer metastasis. Therefore, this project hypothesizes that SON, SRSF1, SRRM2, CTCF, and Rad21 affect hypoxia-induced gene expression and organization. Previously, we used CRISPR-Cas9 to create knock-ins of Halo Tags into these protein-coding genes. We selected a knock-in experiment because it introduces precise permanent modifications at targeted endogenous sites, with a lower risk of off-target effects that alter other genes' expressions. Preliminary findings include successful screening of positive cells with Halo Tags, leading to further analysis into protein localization. The current study uses CRISPR-Cas9 to insert a degradation tag (dTAG), protein tag, and antibiotic resistance gene into each protein's gene sequence. dTAGs cause temporary target-specific protein degradation by recruiting E3 ligase for ubiquitination. It lets us observe the impact of these proteins on the distance of hypoxia-induced genes to nuclear speckles under various conditions using DNA-FISH. A Transwell Migration Assay will evaluate the role of splicing factors and chromatin regulators in breast cancer cell migration. The results can help determine methods to modify hypoxia-induced gene expression in breast cancer, offering novel therapies to combat cancer progression.

2. Probing the Mechanisms of KIF5A Associated ALS Using TurboID Proximity Labeling

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Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease characterized by motor neuron loss in the brain and spinal cord. Recent studies have shown that mutations within the kinesin family member 5A (KIF5A) gene causes familial ALS. KIF5A is an essential motor protein gene that plays a role in intracellular transport by moving cargo such as mitochondria and RNA granules along microtubules. ALS-associated point mutations in KIF5A cause exon 27 skipping (△Exon27), resulting in an abnormal C-terminal cargo binding domain. The purpose of this project is to determine how KIF5A mutations affect interactions with cargos and potential transport regulators using TurboID proximity labeling, an improved biotin ligase. To establish the toolset for proximity labeling, constructs were generated to express TurboID alone or fused to KIF5A WT or disease-causing variants through molecular cloning. Thus, proteins in complex with KIF5A will be labeled with biotin, enabling their purification and identification using mass spectrometry. Expression of KIF5A-TurboID was performed in neuroblastoma cell lines. Subsequently, these cells were labeled with immunofluorescence staining and analyzed with fluorescence microscopy. We also performed western blotting to validate expression and biotin ligase activity. We found that control (TurboID alone) as well as KIF5A TurboID fusion proteins are well expressed and cause a dramatic increase in cellular protein biotinylation compared with the negative control. The WT and mutant proteins yield distinct patterns of biotinylation, suggesting that the mutations cause alterations in motor-cargo complex assembly. These constructs are suitable for future mass spectrometry experiments to elucidate how the altered interactome of mutant KIF5A drives the pathogenesis of ALS.

3. A Divergent Justice: A Comparative Analysis of Command Responsibility in the War Crimes Trials of Bosnia Herzegovina and Serbia

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The principle of command responsibility, a cornerstone of international criminal law, holds commanders liable for failing to prevent or punish war crimes committed by subordinates. However, command responsibility is considered one of the most complex and ambiguous liability theories in international criminal law. After the closure of the International Criminal Tribunal for the former Yugoslavia (ICTY) in 2017, the domestic war crimes chambers of Bosnia-Herzegovina (BiH) and Serbia assumed responsibility for prosecuting war crimes committed by mid- and lower-level perpetrators [1]. This study conducts a comparative case analysis of war crimes trial documents from BiH and Serbia, including judicial decisions, prosecutorial arguments, and defense strategies. Findings show that BiH treats command responsibility as an omission-based liability, while Serbia classifies it as a separate crime. In Serbia, it functions as a 'conceptual adjunct liability,' referenced in court to establish innocence or culpability but not used as a standalone basis for prosecution. The lack of recognition of command responsibility as a liability in Serbia, and its absence as a sole basis for conviction in both countries, does not completely obstruct convictions in the studied cases due to prosecutors' preference for direct participation charges. However, Prosecutions of commanders complicit in war crimes but not directly involved are limited by the absence of established jurisprudence. These constraints hinder the potential for holding higher-ranking officials accountable, where indirect culpability is critical for conviction. This study contributes to the discourse on international law and transitional justice by highlighting the challenges of implementing international legal principles in domestic legal systems and the need for clearer, harmonized standards.

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4. Locating The Medullary Reticular Formation In A Developing Mouse Brain To Understand The Neurons Controlling Orofacial Behaviors

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The medullary reticular formation is a network of brainstem nuclei and neurons composed of circuit pathways from the brain to the spinal cord. It carries out vital roles and orofacial behaviors such as vocalization, swallowing, and breathing. The region of neurons associated with orofacial movement is not clearly defined due to a lack of molecular markers. Many of these orofacial movements are necessary for survival early in life, so it is important to identify the brain regions underlying these behaviors during development. This research aims to understand and locate which section of the medullary reticular formation controls orofacial movements. We hypothesize that we can identify the regions of the reticular formation that control orofacial movement by using gene expression profiles. Due to the lack of annotations in the developing mouse brain for the reticular formation, we believed we could locate the structure using the reticular formation voxels from the adult mouse. We gathered 2,073 genes important genes in the developing mouse brain. With the 2,073 genes from the developing and the 1,465 voxels, we retrieved 2,073 section images, 160μm apart, along with their seed locations' x and y pixel coordinates. To obtain the voxels for the developing mouse brain, we gridded each section image into 50μm x 50μm bins and measured the density of the genes by the number of seed pixels per box divided by the total number of pixels. We found that two or more adult mouse brain voxels mapped to a single developing mouse brain voxel. This finding could help us better understand how the reticular formation is in developing brains, which would be important for understanding neurodevelopmental disorders, such as Sudden Infant Death Syndrome, and developing treatment.

5. Association Between Measures of Body Composition and Sleep Duration and Efficiency in Hispanic/Latino Adults: Results from the HCHS/SOL Study

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Over 45% of Hispanic/Latino adults in the US have obesity [1]. Previous studies have shown that obesity, particularly central obesity, has been linked with shorter sleep duration and poorer quality sleep in Hispanic/Latino individuals, which can increase the risk of cardiovascular disease [2]. Traditionally, obesity has been measured through calculating body mass index (BMI). However, waist-to-hip ratio (WHR) is emerging as a more reliable indicator of health risk, particularly for sleep-related health outcomes [3]. This study aims to examine the relationship between WHR and BMI and sleep in a Hispanic/Latino sample. We hypothesized that 1) Sleep duration and efficiency would be negatively correlated with BMI, and that 2) Sleep duration and efficiency would be negatively correlated with WHR. Data were analyzed from the Hispanic Community Health Study/Study of Latinos dataset (n = 2252, 64% female, mean age = 46.82), which includes measures of sleep duration, sleep efficiency, and body composition, including BMI and WHR. Statistical analyses involved descriptive statistics, Pearson correlation coefficients, and significance testing to examine the relationships between the sleep and body composition variables. Sleep duration had a weak but statistically significant negative correlation with WHR ($r(1878) = -0.077$, $p < 0.001$), indicating that shorter sleep duration was linked to higher WHR. Sleep efficiency had a weak negative correlation with WHR ($r(1878) = -0.107$, $p < 0.001$). However, no statistically significant associations were found between sleep duration or sleep efficiency and BMI. These results suggest that it is important to consider multiple measures of body composition when assessing its impact on sleep health outcomes, and that WHR may be a more appropriate measure of body composition when assessing factors associated with sleep health in Hispanic/Latino populations.

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6. Forward Genetic Screen for a Putative GABA exporter in Bacillus subtilis

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Biofilms are an association of bacteria that adhere to each other and form an extracellular matrix made of carbohydrates, proteins, lipids, and DNA. Biofilm signaling is largely mediated by small chemical messengers, which can impact community physiology and survival. *Bacillus subtilis* is a bacteria that is highly genetically tractable and serves as an ideal biofilm model. *B. subtilis* biofilms produce a significant amount of γ-aminobutyric acid, an amino acid commonly thought of as a human neurotransmitter. Several genes involved in GABA metabolism have been identified in *B. subtilis*; however, there are no known GABA exporters. Preliminary data from our lab leads us to hypothesize that such an exporter exists. To identify the protein responsible for GABA export in *B. subtilis*, forty genes were identified based on homology to known GABA exporters in other species. Mutants were made with each of the genes knocked out individually. These strains contained a genetic construct consisting of a fluorescent reporter driven by a GABA responsive promoter. Removing the exporter gene will cause cells to accumulate GABA and have higher levels of fluorescence. Strains were recorded growing using time-lapse microscopy. Those that appeared bright were sent for metabolite analysis where GABA levels were quantified. Knockout strains of the genes *aimA and gltT* showed higher fluorescence under the microscope and higher GABA levels. GABA challenge experiments also showed that knockouts of these two strains were highly sensitive to the presence of GABA compared to wild-type. Identification of a GABA exporter will allow for better understanding of how the molecule is used in *B. subtilis* and biofilm communities.

7. Investigating Bumblebee Foraging Preferences: A Study on the Attraction to Midwestern Flora Varieties Using a Controlled Chamber Setup

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The Common Eastern Bumblebee, *Bombus impatiens*, represents a native pollinator to North and Central America that holds important roles in maintaining biodiversity and providing agro-ecosystem support. Despite this importance, these pollinators remain at risk due to novel stressors within the Anthropocene- with habitat destruction and removal of native plants being contributors to this increased risk. Assessing how changes in floral landscape and biodiversity impact native pollinator foraging behavior can help mitigate these detrimental effects of landscape modification. Historically this is done through manual surveys and field observations, which can be laborious and time consuming. In the following work we describe a novel high-throughout, automated foraging chamber for assessing bumblebee behavior and floral preference to the introduction of four native flora: dwarf sunflowers (*Helianthus annuus*), delphinium (*Delphinium spp.*), salvia (*Salvia spp.*), and white daisy (*Leucanthemum vulgare*). The experimental workflow was comprised of several key components: 1) a commercially purchased queen-right bumblebee colony 2) colony access to a custom 1x1x2 ft. foraging chamber 3) containing the four native flora 4) triggered camera recordings via Raspberry Pi microcomputer 5) object detection models for automated analysis of foraging behavior. The results showed that the bumblebees effectively utilized the connected transparent tubing to navigate between their hive and the foraging arena. The foraging bees displayed strong initial preference to (*Salvia spp.*) but shifted to the dwarf sunflowers over the course of the experiment. The (*Salvia spp.*) received the highest frequency and duration of visits. These results support the idea that an adjustable, and automated foraging chamber can allow for rapid assessment of bumblebee foraging preferences and pollinator behaviors. This method will continue to be used to bridge the gap between laborious, costly surveillance, and a reduction of sampling error through to the ability to conduct dense sampling and behavioral classification within a confined space.

8. Metal Micro-Fiber Reinforced Thermoplastics for Additive Manufacturing

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Metal micro-fiber reinforced thermoplastics in additive manufacturing offer performance benefits with potential application in structural-lightweighting, friction materials, and biomedical applications. The current research is focused on fused filament fabrication 3D printing a polyethylene terephthalate glycol (PETG) thermoplastic matrix reinforced with Al6061-T6 aluminum alloy micro-fibers. The metal micro-fibers are produced by Modulation-Assisted Machining and incorporated directly in the filament for 3D printing using single screw extrusion. Additive manufactured samples with 10% weight fraction to PETG matrix will be used to characterize the effects of two different aluminum micro-fiber morphologies with length-to-cross section aspect ratios of 1/0.020 (morphology 1) and 2/0.020 (morphology 2). A Bambu X1 Carbon 3D printer was used to 3D print rectangular and tensile “dog bone” samples of plain PETG (baseline), morphology 1 Al/PETG, and morphology 2 Al/PETG. Fundamental parameters of the 3D printing process including nozzle temperature and print bed temperature – along with geometric layer height were varied during printing of samples for each material. The optimal settings for printing each metal micro-fiber morphology of Al/PETG were identified and a relationship between print settings and sample quality was established (via visual inspection, dimensional metrology and optical profilometry). Additional samples were produced using the optimal 3D printing parameters to support subsequent mechanical property characterization via tensile testing and microhardness. The performance of this new class of metal micro-fiber reinforced Al/PETG composites is compared to current commercially available materials in additive manufacturing.

9. Light the Way: Team-Based Peer Mentorship With College Students

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Peer mentorship has been shown to improve academic performance and student retention [1]. However, there is limited research on the impact of team-based mentorship models, which may offer more diverse and robust support systems for students. This study aims to address this gap by evaluating the Light the Way (LTW) program at the University of Illinois Chicago (UIC), focusing on how the team-based approach influences student engagement, belonging, and well-being. The primary objective of this study is to evaluate how team-based peer mentorship affects mentees' sense of belonging, self-efficacy, engagement in campus activities, psychological well-being, and social integration. A secondary objective is to assess how mentors develop leadership skills through their participation in the team-based mentorship program. This mixed-methods, quasi-experimental study involves first-year mentees (n = 12) paired with teams of three mentors (sophomore, junior, and senior). The mentorship model emphasizes social connection and work-life balance over academic or professional development. Data was collected at baseline and at semester's end via surveys and reflection forms, measuring the outcomes of interest in quantitative and qualitative formats. Comparative analyses will examine the relationships between mentorship experiences over time and targeted outcomes. Preliminary analysis shows significant improvements in all outcomes , with the most notable changes occurring among mentees who engaged consistently with their mentors. Prior research has shown that social integration and belonging are critical for first-year students at large, urban public universities. This study advances the literature by exploring an alternative mentorship structure and providing insights into its potential scalability for urban universities aiming to improve student support and retention.

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10. Assessing Socioeconomic Patterns in Recruitment for the PATH 2 Purpose (P2P) Depression Prevention Program Among Adolescents

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PATH2Purpose (P2P) is an online depression prevention program for adolescents aged 13-19. The study aims to bring cognitive behavioral treatment approaches to a diverse population, and recruits participants through partnerships with community health centers either through in-person or through appt reminder recruitment. In this study, the Distressed Community Index (DCI) of participants recruited from UIHealth and the communities served by UIHealth was compared to the goals that the study outlined in the protocol. Results showed that the patterns in DCI of those recruited in IL and through UIHealth did not align with the expected demographics outlined in the protocol based on the location of the clinics with a significantly increased proportion of their patient population coming from economically distressed backgrounds. When the rate of recruitment from each tier of the DCI from each clinic was analyzed, it was found that this pattern is sustained and there is increased recruitment of those from distressed economic backgrounds as defined by DCI than expected from the location of the clinics themselves. These findings serve to elucidate recruitment patterns found throughout UIHealth clinics and introduce a trend that may account for the disparity between the DCIs observed and those that had been anticipated.

11. Characterization of Novel Tightly-Bound Ubiquinone Binding Site in Vibrio Cholerae NQR

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Vibrio cholerae is a gram-negative bacterium that is the causative agent of the disease cholera. It contains the Na^+-pumping NADH-quinone oxidoreductase (Na^+- NQR), a transmembrane enzyme composed of six subunits, as the main ion transporter and first enzyme in its respiratory chain. By oxidizing NADH and reducing ubiquinone, NQR facilitates the generation of an electrochemical gradient of Na^+ ions across the bacterial inner membrane. This results in energy production. As ubiquinone is the final electron acceptor of NQR, its binding site is a desirable functional and structural motif for drug design. While the location and properties of five of the redox factors are known through crystallographic studies, the ubiquinone binding site is more controversial. A Cryo-Em structure (8EVU) published by our laboratory shows the placement of the bound quinone in *V. cholerae* Na^+- NQR. Furthermore, it shows that the quinone is within the subunits A and B in NQR, specifically 11Å away from the riboflavin in NqrB. This is important as it means that it helps support effective electron transfer. In this study, alanine scanning mutagenesis and mutant kinetic analysis were performed on the amino acid residues in NqrB of in *V. cholerae*. Through examination of the ubiquinone binding and catalysis, it was noted that mutations at positions K54, M57, and F159 led to significant reduction in turnover rate and increased K_m for ubiquinone. Furthermore, an HQNO inhibition assay was performed to better understand the two ubiquinone binding sites. HQNO is a ubiquinone analog and binds to the same sites as ubiquinone in the NQR complex. Previous studies conducted by our group show that it is a mixed-type inhibitor. Upon conducting the inhibition assay, the mutants showed increased resistance to HQNO. All these findings suggest that the residues play crucial roles in the structural and catalytic functioning of NQR.

12. Cracking the Blocks: Decoding the Precursors of Extreme Heat

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Europe, a "climate change hot-spot", has seen – and will continue to see – more frequent heatwaves as the planet warms. As one of the most frequently “blocked” regions on Earth, the Euro-Atlantic is central to understanding how these heat extremes are generated via atmospheric blocking. Atmospheric blocking, or “blocking”, is a long-lasting, quasi-stationary, and self-sustaining weather pattern that impedes westerly atmospheric flow. It is closely related to heatwaves because, under normal circumstances, westerly flow allows the atmosphere to disperse excess heat. However, the complexity of blocking formation and decay present significant challenges for its prediction. Recently, the traffic jam model, a discovery that blocking has mathematical similarity to traffic flow on a highway, demonstrated that predicting a block’s onset requires predicting the incoming flow of “traffic” (weather systems) upstream of the block [1]. Therefore, a potential way to improve blocking and heatwave predictions is to study this incoming flow. Still, a critical gap remains – do specific incoming flow patterns (“precursors”) exist that lead to blocks and extreme temperatures? To close this gap we apply statistical methods, including unsupervised machine learning, to identify coherent precursor states and investigate their evolution into blocked states. We then use the traffic jam framework to understand their physical formation. Thus far, we have extracted and identified relevant information about heatwave events from 1980-2023, and we have compared it with local wave activity (one measure of atmospheric blocking). We then performed k-means clustering in latent space of local wave activity. Provisional results are consistent with physical mechanisms linking wave activity to heatwave development. To expand upon these findings, we will explore techniques to evaluate and confirm our clustering analysis. By investigating precursors to temperature extremes, we will contribute to better anticipation and response strategies for future heatwaves and our overall knowledge of climate predictability.

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13. Discovering Syndemics (Diseases that Emerge in Communities and are Aggravated by Social, Economic, Environmental, and Political Factors).

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Physicians typically diagnose and treat diseases based on individual symptoms, but the syndemics model offers a broader perspective, considering social, environmental, and psychological factors that exacerbate disease interactions. A syndemic refers to the occurrence of interrelated diseases influenced by external stressors, which can worsen health outcomes. Our goal is to assist physicians in identifying syndemics that may impact treatment effectiveness. From a data science perspective, discovering syndemics involves analyzing patterns of disease co-occurrence and their connections to patient demographics using clustering techniques. Our dataset comprises approximately 95,000 patients with 30 disease attributes and multiple socioeconomic indicators, including BMI, primary care visits, race, ethnicity, sex, insurance status, and social vulnerability indices. We initially applied K-means and K-mode clustering algorithms due to their efficiency but are now investigating hierarchical clustering methods, which offer greater granularity in identifying relationships between diseases. To refine our findings, we are integrating statistical and computational clustering techniques such as Principal Component Analysis (PCA), Yule's Q, Agglomerative Clustering, and Jaccard Distance to uncover deeper connections. Additionally, we are exploring similarity measures like the Sorensen-Dice coefficient and Cosine similarity to improve accuracy in detecting disease associations. Initial data visualization highlighted correlations between race, age, sex, healthcare access, and disease prevalence. An Observed-to-Expected Ratio analysis revealed a potential syndemic involving asthma, breast cancer, endometrial cancer, and non-Alzheimer's dementia. Moving forward, we aim to enhance our analytical framework by experimenting with different clustering models to improve disease pattern recognition. Collaborating with physicians, we seek to validate our results, ensuring that our models align with clinical expertise. This interdisciplinary approach can potentially improve patient diagnosis and reshape how data scientists analyze disease relationships in healthcare research.

14. A Novel Gene Regulatory Role of Histone H1.1 in Epidermal Differentiation

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The linker histone H1 is a component of chromatin that binds DNA at the entry and exit sites of the nucleosome. While major advances in the fields of epigenetics and chromatin biology have focused on core histones and their post-translational modifications, the role of the linker histone H1 and its variants remains greatly understudied. A previous study in mice led to assumptions about redundancy between H1 variants, but this is being challenged by recent reports of singular H1 variants as activators and repressors of gene expression. All H1 variants have reported gene regulatory functions except for the H1.1 variant, which is the least abundant and least conserved variant expressed in human somatic cells. This project leverages the human skin epithelium (epidermis) as a research platform to characterize a novel gene regulatory role of H1.1 in epidermal differentiation. We have tested the hypothesis that expression of H1.1 by epidermal progenitors is required to repress terminal differentiation. A knockdown of H1.1 mRNA in progenitor cells was performed using RNAi, and the expression of genes known to be expressed during differentiation was measured by RT-qPCR. We found that knockdown of H1.1 caused a significant upregulation of differentiation-associated markers and transcription factors. A subsequent clonogenicity assay was performed to assess the regenerative capacity of progenitors upon H1.1 knockdown. These results confirmed that knockdown of H1.1 significantly reduces self-renewal capacity of progenitors. Taken together, our findings indicate that H1.1 plays a critical gene regulatory role in repressing differentiation and maintaining self-renewal of epidermal progenitors. With further investigation into how H1.1 may be affecting chromatin architecture and dynamics, we seek to uncover the broader processes governing this novel role of H1.1 as a regulator of transcription.

15. Using Topological Data Analysis to Understand Biological Invasions

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The spread of non-native species has become a major environmental issue with significant social and economic consequences. Understanding the interactions between species and complex ecological systems can be challenging. Network theory is an active research area biologists use to understand ecological systems. While a network can be represented mathematically as a graph, it can also be understood as a topological object. Tools from algebraic topology are very useful in analyzing and characterizing networks. One advantage of using topology to analyze this data is that topology detects features that traditional statistical methods miss. In our research, we have adapted key algorithms from Topological Data Analysis to understand different types of biological interactions, such as food chains and predator-prey relations. Furthermore, we have discovered a beautiful application of multi-persistence techniques to capture the evolution of biological networks over time as new species get introduced and others become extinct.

16. The Respiratory Chain of *Klebsiella aerogenes* in Urine-Like Conditions: Critical Roles of NDH-2 and *bd*-terminal oxidases

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Abstract: *Klebsiella aerogenes* is a gram-negative bacterium that is responsible for multiple infections, most notably urinary tract infections (UTIs) and pneumonia. It is an opportunistic, nosocomial pathogen that has developed resistance to common antibiotics leading to the emergence and infection of multidrug resistant strains and even pandrug-resistant strains in its most severe form. The difficulty of treating infections stemming from *Klebsiella aerogenes* not only makes it a global priority for the development of new antibiotics, but it has also earned its inclusion in the ESKAPE group, which encompasses important pathogens that are associated with high degrees of antimicrobial resistance. To study the metabolism and metabolic adaptations of this bacterium in infection sites, we study the respiratory metabolism in conditions mimicking human urine. We have identified a novel antibiotic target in the type-2 NADH dehydrogenase (NDH-2). This respiratory enzyme serves as the main point of entry for electrons in the respiratory chain in all growth conditions evaluated. In urine-like media specifically, there is a significant upregulation in the activity of succinate and lactate dehydrogenase. Additionally, our results show that the *bd*-I type oxidoreductases are the main terminal oxidases of this microorganism. The promise of the initial identification of NDH-2 and *bd*-I oxidase as attractive targets for the development of new drugs against *K. aerogenes* stems from the fact that these enzymes are not found in the respiratory chains of human hosts.

17. Optimization of Mfp5 Production Through T3SS-Mediated Protein Secretion

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Protein-based biomaterials are often implemented in sensors and adhesives. Recombinant DNA technology has made the rapid, high-titer production of these biomaterials possible. Still, production is limited by various shortcomings of microbial expression such as the formation of intracellular protein aggregates and inclusion bodies, which elicit costly and time-consuming purification processes. *Salmonella enterica's* Type III Secretion System (T3SS) bypasses these issues, secreting proteins of interest (POIs) directly from the cytosol to the supernatant. One such biomedically relevant POI is Mfp5, a mussel foot protein that allows mussels to attach to solid substrates in aqueous environments. Mfp5 can be repurposed to construct medical sensors or prevent bacterial infections, making its optimized production essential [1, 2]. Currently, Mfp5 has only been synthetically produced using *Escherichia coli* and the gram-positive bacteria *Bacillus subtilis*, which features challenges in its secretion pathway, such as protease activity that can degrade the protein [3]. While *S. enterica* lacks this issue, previous attempts have shown that its T3SS does not naturally secrete Mfp5. To overcome this, the Mfp5 construct was genetically engineered for improved compatibility with the T3SS by incorporating a gene encoding SicP, a native chaperone that keeps heterologous proteins partially unfolded and directs them to the T3SS, facilitating their secretion. An additional 2xFLAG purification tag was also included. Unlike previous unoptimized constructs, these modifications enabled successful Mfp5 expression and secretion. Further optimization was attempted by overexpressing hilA, a T3SS transcriptional factor. The expression and secretion levels of this updated construct were compared across wild-type *S. enterica*, hilA-activated *S. enterica*, and a previous unoptimized construct via western blotting. Ongoing efforts aim to quantify secreted protein and further optimize secretion by

overexpressing hilD, another T3SS activator, and knocking out hilE, a negative regulator. This advancement in Mfp5 production has the potential to streamline the creation of various biomedical products.

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18. From the Ashes: A Cross-Cultural Comparative Study on Community Response to Fire Disaster in Australia, Greece, Portugal, Ghana, Argentina, and Brazil

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Climate change has increased the frequency and severity of wildfires worldwide [1], yet the response to these disasters remains largely driven by suppression rather than prevention [2]. This research investigates community-based wildfire response strategies across six case studies—Australia, Greece, Portugal, Ghana, Argentina, and Brazil—to analyze how social, political, and cultural factors shape fire management policies. The central hypothesis suggests that integrating local knowledge and grassroots mobilization into formal fire response frameworks enhances community resilience and reduces long-term fire risk. Employing a mixed-methods approach, this study incorporates ethnographic fieldwork in all six cast study sites, semi-structured interviews with 34 experts and community stakeholders, and archival analysis of policy documents. The research identifies competing risk frames influencing fire governance, including ecological destruction, economic interests, and political accountability. Findings demonstrate that fire suppression is often prioritized at the expense of proactive, community-led fire mitigation efforts. Indigenous fire management practices in Australia, Ghana, and Brazil have gained traction but face institutional barriers to widespread implementation. In Portugal and Greece, historical land management policies have exacerbated fire risk, while political instability in Greece and Argentina has hindered sustainable fire policy development. The study concludes that fire management strategies must move beyond suppression to embrace localized, prevention-focused interventions rooted in community engagement. The persistence of colonial and neoliberal land policies has contributed to fire disasters, highlighting the need for policy shifts that prioritize environmental stewardship and social equity. By centering fire governance within cultural and historical contexts, this research contributes to a broader understanding of how climate adaptation must integrate interdisciplinary and community-driven approaches to address escalating fire risks globally.

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19. Navigating TikTok's GLP-1 Agonist Content: Evaluating the Quality, Reliability, and Influence of Health Information

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TikTok has become a major platform for health information, particularly regarding GLP-1 agonists like Wegovy and Ozempic, used for weight management and diabetes treatment. However, the vast amount of content raises concerns about its accuracy, requiring users to critically assess sources. This study was conducted to analyze TikTok videos using the hashtags #glp1agonist, #wegovy, #ozempic, and #zepbound. The top 100 videos for each hashtag were reviewed, excluding videos in languages other than English, those not

including the search term in the narration, and videos no longer available. Videos were classified as informational, misleading/irrelevant, or personal experience, with personal experience videos further categorized by sentiment (positive, negative, neutral).

A total of 371 videos were analyzed, with an average of 7,188 views per day and 334 daily interactions. 82% of the videos were posted by non-medical individuals, while 18% were from healthcare professionals. Of the 371 videos, 88 were informational, 273 were personal, and 4 were misleading. The average GQS rating for all videos was 1.80. Informational videos had an average DISCERN score of 43.59 and a modified mDISCERN score of 2.41. Informational videos were rated higher on the GQS compared to personal videos ($p < 0.0005$). Personal videos about Ozempic and Zepbound had a higher likelihood of the poster being an affiliate of a product or service ($p < 0.04$).

This study underscores the importance of awareness and critical thinking when navigating the increasing volume of GLP-1 agonist content on social media–TikTok users must carefully evaluate the content they consume. While some videos offer valuable information, others may be designed to sway viewers into purchasing products for the benefit of the content creator.

20. Structure-Activity Relationship Profiling of Triaminopyrimidine Inhibitors of Caspase-1

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Caspases serve as the primary director in the instigation of apoptosis and regulation of immune response. Thirteen mammalian inflammatory caspases are currently known, and all perform cysteine-dependent cleavage at targeted aspartic acid residues. Because of the significant roles of caspases in the inflammatory immune response, their activity has been a primary focus for inhibitor development. Potent inhibitors enable the study of caspases and can be used to guide therapeutic discoveries for inflammatory related diseases. A previously discovered family of potent non-competitive inhibitors has been found for caspase-1 that share a common triaminopyrimidine scaffold. While previously developed inhibitors have been shown to be competitive, literature synthesis for non-competitive inhibitors remains limited. Variations of the diamino substituents on the pyrimidine ring are desired to develop a more robust structure-activity relationship profile. Additionally, an irreversible covalent inhibitor of caspases is desired to probe the binding site of the triaminopyrimidine inhibitors. Described here are the efforts towards synthesizing both sets of inhibitors.

21. Nuclear Abolition Activism on Campus: Catalysts and Motivations for Action

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The nuclear abolition movement has persisted for over 70 years but has struggled to regain momentum since the peak of the Nuclear Freeze Movement in the 1980s. Political setbacks, such as the approval of the MX missile, fueled disillusionment, weakening the movement and contributing to a decline in activism [1]. Yet, as the Doomsday Clock ticks closer to global catastrophe—now at 89 seconds to midnight—nuclear disarmament remains largely led by older generations [2]. While public interest in nuclear issues persists, particularly in understanding weapons and their effects, this concern has not translated into widespread activism [3]. This study examines why Gen Z, particularly college students, remain disengaged from nuclear activism, exploring how identity, fear, and political polarization shape involvement. Prior research on youth engagement is outdated, focused primarily on Cold War-era movements. Assessing contemporary barriers is key to the future of nuclear abolition efforts. This research investigates perceptions of nuclear activism among Northwestern University students through a two-phase approach: an initial survey (n=129) gauged general attitudes, followed by in-depth interviews (n=8) exploring identity-based motivations. While 79.8% of respondents engaged in activism, only one respondent indicated participation in nuclear-related efforts. The most cited barrier was lack of knowledge (74.3%, n=84), followed by nuclear abolition not being a priority (63.2%, n=72). Interviews revealed that students primarily engaged in activism related to identity-based causes, which they viewed as more relevant than nuclear disarmament. While participants expressed concern over nuclear issues, they lacked pathways to integrate them into activism. These findings highlight the failure of education, media, and outreach to make nuclear abolition a priority for college-aged adults. Future research should examine broader generational attitudes and explore strategies to bridge the knowledge gap, particularly by linking nuclear activism to identity-based movements that resonate with younger populations.

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22. The "Finger Pointing Test" for the Assessment of Visual Acuity in Children

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We propose a clinic-developed "Finger Pointing Test" as an alternative method to measure visual acuity in infants and young children. Variations of a single finger symbol pointed either left, right, up, or down were used to assess visual acuity in children aged 2-5 in a retrospective analysis. Children were shown variations of the symbol and asked to mimic the symbol seen with the direction of their fingers. The test was scored using standard Snellen notation. The test was validated through prospective analysis, in which older children and adults were shown both the fingers and Snellen characters when measuring visual acuity. The "Finger Pointing Test" proved reproducible and correlated with standard visual acuity testing (R^2 = 0.89). Patient compliance was also found to increase among infants and younger children due to no prior knowledge of images, letters, numbers, symbols, or general vocalization required. Due to the nonverbal nature of the "Finger Pointing Test," the test can be universally implemented. By breaking language barriers, the test can have further applications with patients who lack understanding of English characters, nonverbal patients, patients with speech impediments, and patients with language disorders such as Broca's (expressive) aphasia to increase accessibility in visual acuity testing.

23. Trait Mindfulness and Affective Polarization: Relationship Depends on the Measures of Political Polarization

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Affective polarization refers to the tendency to hold positive feelings toward one's own political party and negative feelings toward the opposite political party. A challenge in measuring affective polarization is that some measures capture general *feelings* towards the opposing party and others capture willingness to *engage socially* with members of the opposing political party. (Druckman and Levendusky, 2019). Previous research indicates that these two sets of measures are weakly correlated and may capture distinct constructs (Druckman & Levendusky, 2019). Recent research has also found that mindfulness training can reduce affective polarization over time, but has found little evidence relating mindfulness as a trait with affective polarization measures (Simonsson et al., 2022). The aim of this study was to investigate the relationship between trait mindfulness and affective polarization, particularly how this relationship might differ across distinct measures of out-party sentiment. The Southampton Mindfulness Questionnaire was used to measure trait mindfulness. Trust measures and the feelings thermometer were used to measure sentiment towards the out-party overall, while social distance items–eg: "How comfortable are you having neighbors on your street who are Democrats/Republican?"–were used to assess interpersonal or social manifestations of affective polarization. The analysis revealed that trait mindfulness scores were significantly correlated with social distance measures of affective polarization, but not to the feelings thermometer or a trust measure for the out-party. In other words, trait mindfulness appears to be related to greater willingness to be socially engaged with members of the opposite political party, but has no relationship to overall feelings toward the out-party. In addition, trust and feeling thermometers were highly intercorrelated (R = .76, p<.001) while social distance items were weakly to moderately correlated with the other measures (R = .22-.40, p <.05), replicating a pattern found in previous studies.

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24. Parameter and Equilibrium Analysis of Predator-Prey ODE System with the Allee Effect

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Systems of Ordinary Differential Equations (ODEs) are one of the main tools used to study population dynamics. One famously successful example is the Predator-Prey model, originally formulated by A. Lotka (1925) and V. Volterra (1926), independently [1], which aimed to capture the population dynamics of two species where one of the species predates on the other. In this work, we analyze a modified version of traditional predator-prey models, combining the Lotka-Volterra equations with the Logistic Growth model and incorporating a term that represents the Allee Effect. The Allee Effect describes a positive correlation between the population density and the fitness of the prey population [2]. Essentially, this means that the prey species thrive at higher population densities but face the risk of extinction if their numbers fall below a certain threshold. This effect is crucial for describing species that depend on collectivist behaviors such as collective parenting or mutual defense against predators, where low populations can result in the species' inability to sustain these behaviors, leading to their eventual extinction. Our analysis focuses on the equilibrium behavior of the system, with particular emphasis on determining the conditions for stability. We studied the system qualitatively and using numerics. Further theoretical analysis was done through analyzing the eigenvalues of the Jacobian around the equilibrium points. We found that the stability of the system is predominantly influenced by the relationship between a key hyperparameter derived from the characteristics of the predator species and the Allee threshold and the carrying capacity of the prey population.

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25. Lack of Estrogens Result in Cardio Metabolic Dysfunction in a HFpEF Model

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Heart Failure with Preserved Ejection Fraction (HFpEF, EF > 50%), accounts for over 50% of all heart failure cases, disproportionately affecting women.Despite its prevalence is rising, effective treatments are still lacking, and suitable preclinical mouse models for studying the disease's pathophysiological mechanisms remain scarce. Postmenopausal women are at an increased risk of developing HFpEF due to the decline in estrogen levels, which contain protective effects on the heart. The loss of this protection contributes to worsened cardiac outcomes and higher mortality rates. This gender disparity highlights the need for more research focused on how estrogen influences HFpEF, specifically in women. In this study, a mouse model is used to replicate pre- and post-menopausal conditions in female mice, which are then challenged with excess mineralocorticoids and a western diet to mimic the cardiometabolic effects of HFpEF. We hypothesize that estrogen depletion exacerbates the cardiometabolic phenotype in this mouse model of HFpEF, leading to worsened heart function and metabolic disturbances. Estrogen depletion was achieved by performing an ovariectomy (OVX) on 6-week-old female mice. At 8 weeks of age, the mice were divided into the following four groups: Control, HFpEF, OVX, and HFpEF + OVX. After 6 weeks of treatment, cardiac function and morphology were evaluated using echocardiography, metabolic tests were conducted, and the mice were then sacrificed. Findings revealed that the lack of estrogens leads to pronounced cardiac hypertrophy, increased adiposity, loss of lean mass, elevated heart weight, and elevated lung weight suggesting hypertrophy and pulmonary edema respectively in the HFpEF mouse model. These results indicate that estrogen plays a crucial protective role in cardiovascular health, and its depletion may significantly contribute to the development of HFpEF. Ultimately, these findings improve our understanding of HFpEF and provide insights for developing targeted therapies that address the needs of women, thereby improving health outcomes.

26. The Role of Sleep Environment in Insulin Resistance Among Black/African American Pregnant Individuals

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Adverse social determinants of health including environmental factors disproportionately affect minority pregnant individuals, potentially contributing to poor sleep and poor cardiometabolic health outcomes. This study aimed to investigate the association between sleep environment and insulin resistance in Black/African American pregnant people. We analyzed baseline data from 87 participants enrolled in the BETTER lifestyle counseling study (NCT05234125). Insulin resistance was measured using HOMA-IR and C-peptide values. Sleep environment was assessed through validated measures, including light, noise, and temperature disturbances in the sleep setting. Covariates included age, gestational age, and body mass index. Participants had a mean age of 29.89 years, gestational age of 18.6 weeks, and a body mass index of 33.02 kg/m². Sleep environment disturbances were significantly associated with increased insulin resistance. Specifically, poor sleep environments contributed to a 2% increase in HOMA-IR (95%CI: 0.02%, 4.1%) and a 1.3% increase in C-peptide levels (95%CI: 0.04%, 2.7%). Findings highlight the impact of poor sleep environments on insulin resistance among Black/African American pregnant individuals. Interventions addressing sleep environment factors, such as optimizing bedroom conditions, reducing noise, and improving comfort, may mitigate adverse cardiometabolic outcomes. These efforts could contribute to improved maternal and child health outcomes in this population.

27. Comparison of Kinetic Parameters of Caspase-Substrate Reactions for Selectivity Analysis.

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Human inflammatory caspases-1, -4, and -5 are aspartate-directed cysteine proteases that are involved in the innate immune response. An *in vitro* Förster resonance energy transfer (FRET)-based assay has been developed in order to differentiate the roles of individual caspases in inflammatory pathways and aid in the development of selective caspase substrates and inhibitors. The FRET-based assay allows measured fluorescence intensities to be used to determine the rate of caspase activity on peptide substrates, as the cleavage process separates the donor and acceptor chromophores, causing an increase in donor fluorescence signal. To assess the selectivity of peptide-caspase pairs, kinetic parameters will be compared, assuming both the Michaelis-Menten model and using more complex modeling of enzyme kinetics. Reactions of caspases with various FRET peptides were compared with both experimental and computational methods. The optimal FRET assay conditions for separate caspases are distinct and will be discussed. Furthermore, optimization of experimental conditions, such as plate reader settings and mixing protocol, have allowed for more accurate and sensitive results through the avoidance of the inner filter effect and improvement of solubility issues.

28. Dual-Chronoamperometry Drift Correction for Electrochemical Sensors

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Electrochemical sensors offer a powerful tool for the future of point-of-care testing platforms due to their potential for reagentless, continuous operation, which is vital for tracking biomarkers that vary on a short time scale. However, biofouling and signal drift challenge the accuracy of electrochemical measurements. Chronoamperometry (CA), a potent technique measuring time-dependent current, offers high sensitivity, but it has not been studied for drift correction due to its perceived resistance to drift. However, drift arises from self-assembled monolayer (SAM) desorption and biofouling, obscuring the results of CA techniques. This project investigates a novel dual-CA method with faradaic current extraction to address drift. This project uses the molecular pendulum (MP), a sensing platform that uses a rigid linker with a target receptor and redox reporter molecule to sense temporal changes in CA current. The current consists of both faradaic (electron transfer) and capacitive (movement of charges) current instead of isolating the faradaic current which can lead to difficulties in analyzing data, especially when drift occurs. The dual-CA technique allows for the extraction of faradaic current and drift correction by applying mirror positive (test) and negative (reference) potentials. This was tested by measuring current drift in the positive and negative currents during SAM desorption as affected by a mercaptohexanol backfill. Controls for gold and oxygen redox events were also tested by confining the potential range and sparging test solution to exclude redox events. The dual-CA technique was then used for interferon-gamma sensing. Test and reference currents were found to correlate linearly over time as drift occurred under all conditions allowing for faradaic current extraction, while using a mercaptohexanol backfill promoted a more stable signal. Interferon-gamma was detected at varying concentrations. This dual-CA technique expands the opportunities for sensing applications by improving the reliability of the method to address the challenges of biofouling.

29. Investigating the Impacts of XBP1s Overexpression in Oligodendrocyte Progenitor Cells in a Remyelinating Mouse Model of Multiple Sclerosis

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Multiple Sclerosis (MS) is a chronic autoimmune disorder that results in the targeted destruction of myelinated axons within the central nervous system (CNS). Oligodendrocytes produce a high load of plasma membrane during myelination, making them highly susceptible to endoplasmic reticulum (ER) stress. Coupled with this, inflammation induced ER stress is one of the driving mechanisms leading to oligodendrocyte cell death in MS. The unfolded protein response (UPR) is an innate adaptive cellular response involved in reducing ER stress. Upon stress, IRE1 activates and splices XBP1 mRNA, producing XBP1s, which enhances UPR gene expression. Recent studies suggested that XBP1s is important for normal developmental myelination and remyelination after injury in Schwann cells. Therefore, we hypothesized targeted activation of the IRE1/XBP1s branch of the UPR in oligodendrocyte progenitor cell (OPC) may alleviate ER stress, promote OPC differentiation, and enhance myelination. We generated conditional knock-in mice that overexpress XBP1s in OPCs (ROSA26-XBP1s; PDGFRa-Cre), that were subsequently subjected to an inflammatory remyelination model established by our lab. Current trends in our data suggest an increase in both OPCs and pre-myelinating oligodendrocytes in the transgenic line compared to the control, indicating that OPC differentiation is enhanced through overexpression of XBP1s. This study will explore the potential of IRE/XBP1s as a possible clinical target for treating MS.

30. Aging in Displace: How do Aging Chinese Immigrants in Chicago Chinatown (Re)Construct Successful Aging under Transnational Migration?

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The aging immigrant population in the United States is increasing at unprecedented rates, yet research on their experiences remains limited. This study examines the aging experiences of first-generation Chinese immigrant elders in Chicago's Chinatown with a critical gerontology lens, focusing on how they conceptualize and navigate successful aging under transnational migration. Findings reveal that ethnic Chinese migrant elders hold overlapping yet distinct cultural conceptualizations of ideal old age that are practical-oriented compared to the established concept of successful aging. It is manifested in three major ways: (1) elders navigate contesting cultural ideas of care responsibility to adapt to modern family configuration; (2) they adopt a practical understanding of temporality, emphasizing the present realities of aging; and (3) Chinatown serves as a site that provides essential resources for aging in place. By centering the subjectivity of immigrant elders, this research expands dominant aging frameworks to account for cultural, structural, and transnational influences.

31. Iron Wood in Construction

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The design of low-cost housing should begin with the selection and use of eco-friendly material which provides better features than traditional building material. It is known fact that construction sector like cement and steel industries are the primary cause for the environmental pollution. Steel is costly when compared to Bamboo, which leads to uneconomical construction and the production of steel also leads to environmental pollution. As a result of the rising cost of building materials, it has become necessary to search for affordable and cheaply obtainable material which might be partially replaced with cement in concrete production and replacement for steel. Usually, conventional methods of construction use non-eco- friendly and non-renewable materials.

To overcome these problems, the bamboo concrete composite elements can be used as an alternate for concrete used in low-cost housing. Bamboo concrete composite structural members can provide tailored solutions to the eco- housing initiatives at cheaper costs. The results accrue the advantage obtained by the composite members when compared to standard reinforced concrete. The use of bamboo which is a fast growing and ecologically friendly material for structural applications. The tensile strength of bamboo is quite high and is comparable to that of mild steel. This makes bamboo a good alternative to steel in tensile loading applications. Bamboo leaf ash is used as a replacement for cement which encourages practice of bamboo agriculture and minimizes the use of cement which in turn improves ecological balance and economy in construction. This study emphasizes the importance of usage of bamboo as a non-conventional construction material and to develop engineered bamboo structural application for use in low-cost housing.

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32. Effects of Pharmacologic Inhibition of TRIP13 on EMT Marker Vimentin in Glioblastoma Multiforme

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Glioblastoma multiforme (GBM) remains one of the most devastating cancers with a median survival of 15 months despite radiation, chemotherapy with temozolomide (TMZ), and maximal safe surgical resection [1]. We previously showed through CRISPR-Cas9 studies that Thyroid receptor-interacting protein 13 (TRIP13), an enzyme of the AAA-ATPase family, is highly upregulated during TMZ therapy. Emerging evidence suggests that TRIP13 overexpression upregulates vimentin, a marker of epithelial-mesenchymal-transition (EMT), and promotes cell migration and invasion in other cancers. Furthermore, phosphorylated vimentin (pVIM) has been implicated in cancer cell motility and invasion [2]. Thus, we examined the effect of TRIP13 inhibition on pVIM expression using small-molecule TRIP13 inhibitor DCZ0415 in vitro within multiple GBM cell lines. We hypothesized that TRIP13 inhibition would decrease pVIM expression in vitro. pVIM expression was examined with immunocytochemistry and western blotting techniques after treating multiple GBM cell lines (GBM43, GBM38, and GBM6) with DMSO (control), TMZ, DCZ0415, and combined TMZ and DCZ0415 treatment for 72hr. pVIM expression was increased in the TMZ condition relative to the control and decreased in the DCZ0415 condition. Surprisingly, we also show that though pVim is traditionally in the cytoplasm, there was increased nuclear localization in all cell lines after TMZ treatment relative to DMSO. Nuclear pVIM has not been studied in GBM but has been associated with migration and invasion in other cancers by acting as a transcription factor for Cdc42, cathepsin B, and cathepsin D [3]. We found that this phenomenon was inhibited with DCZ0415 treatment. Thus, inhibition of TRIP13 may be a strategy to decrease GBM cell invasion and migration. These findings suggest that understanding the regulation of pVIM expression and localization through TRIP13 could elucidate mechanisms of invasion within GBM during and post-TMZ therapy, informing future treatments.

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33. Estrogen Counteracts Age-Related Decline in Beige Adipogenesis Through the NAMPT-regulated ER Stress Response

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Thermogenic beige adipocytes are recognized as potential therapeutic targets for combating metabolic diseases. However, the metabolic advantages they offer are compromised with aging. Here, we show that treating mice with estrogen (E2), a hormone that decreases with age can counteract the age-related decline in beige adipogenesis when exposed to cold temperatures, while concurrently enhancing energy expenditure and improving glucose tolerance in mice. Mechanistically, we find that nicotinamide phosphoribosyl transferase (NAMPT) plays a pivotal role in facilitating the formation of E2-induced beige adipocytes, which subsequently suppresses the onset of age-related ER stress. Furthermore, we found that targeting NAMPT signaling, either genetically or pharmacologically, can restore the formation of beige adipocytes by increasing the number of perivascular adipocyte progenitor cells. Conversely, the absence of NAMPT signaling prevents this process. Together, our findings shed light on the mechanisms regulating the age-dependent impairment of beige adipocyte formation and underscore the E2-NAMPT-controlled ER stress pathway as a key regulator of this process.

34. Patterns of Inflammation Are Associated with Patterns of Fecal-derived Metabolites Across Human and Nonhuman Primate Gut Microbiomes

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The gut microbiome, representing both the community of microbes inhabiting the gut and their genetic material, plays an essential role in influencing and interacting with the immune system, contributing to the overall well-being of hosts and diverse functions vital for development throughout life. Yet, understanding the relationship between gut microbiota and the immune system across host species is incomplete and limited as there is a lack of examples from a great variety of species, particularly nonhuman primates, who share phylogenetic relatedness to humans. The current study draws on differences between human and non-human primate gut microbiomes and resulting implications for human immune responses upon exposure through cytokine analysis. Through an ex-vivo cell culture protocol, different cell culture conditions with different fecal supernatant quantities of 40uL, 10uL, and 1uL were exposed in 40uL of cultured human venipuncture blood. Immunoassays were used to compare the range of inflammation of IL-6 and TNF-α expressions. The fecal supernatant condition contributing to the most variation in inflammation across species was identified, which was 40uL. The high levels of inflammation for decreasing quantities of fecal supernatant could be attributed to the lack of a cell buffer that can create a comfortable environment minimizing cell death and increased inflammatory markers. Given that metabolite levels differ between human and nonhuman primates and intensity of cytokine response to a specific microbial stimulation is cytokine-dependent, resulting patterns of inflammation can show what cytokines are linked to specific microbes and metabolic pathways. Comparative analysis through metabolomics and 16s rRNA sequencing with non-human primates can reveal previously unknown microbial strains or functions unique to specific groups that are crucial in immune regulation, which can lead to greater understanding of microbial diversity within the gut and evolutionary distinctions in the interconnected relationship between the gut and the immune system.

35. Childhood Household Wealth Mobility and Mental Health in Young Adulthood: Evidence from the Cebu Longitudinal Health and Nutrition Survey

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Abstract: Childhood socioeconomic conditions have lasting effects on mental health, but less is known about how changes in household wealth across childhood are associated with mental health. This study investigates the correlation between childhood household wealth mobility and mental health outcomes—depression and perceived stress—among participants of the Cebu Longitudinal Health and Nutrition Survey, a birth cohort study in Cebu, Philippines. Asset indices were created for five survey waves (baseline, age two, 1991, 1994, and 1998) as proxies for wealth. Wealth mobility groups were constructed using group-based trajectory modeling to categorize participants into Stable-Low, Low-Upward, and High-Upward wealth trajectories across the waves, when the participants were 0-15 years old. Linear regression models were then used to assess the correlation between wealth trajectories and mental health outcomes at ages 21-22. Compared to the Stable-Low group, depression scores for the Low-Upward group were lower on average (-0.16 SD, 95% CI: -0.26, -0.05). An even larger difference was observed with High-Upward group (-0.37 SD, 95% CI: -0.52, -0.22). No significant difference in perceived stress was found for both the High-Upward or Low-Upward groups. These findings suggest that upward wealth mobility during childhood could be associated with modest improvements in mental health, particularly depression, yet not perceived stress. However, the limited effect sizes highlight the importance of additional sociocultural and life course factors. Future research should explore long-term mental health outcomes and the intersection of wealth mobility with other sociocultural contexts.

36. The Impact of Narcissism on Peer Attachment: Moderating Effects of Callousness and Unemotional Traits

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This study examines the influence of narcissism on social attachments, specifically peer attachment, by exploring how traits of self-centeredness, grandiosity, and a need for admiration affect trust and communication in relationships. [1] Additionally, it investigates the moderating role of callousness and unemotional traits, characterized by a lack of empathy and disregard for others' feelings, in shaping these social bonds. By analyzing the interaction between narcissism and these traits, the study aims to better understand the complexity of social attachments in individuals with varying levels of narcissistic and callous tendencies. The descriptive statistics indicate variability across variables, with callousness and narcissism being relatively low on average among participants. The mean score for narcissism (T1narc) was relatively low (M = 1.3918, SD = 0.8223), indicating that the majority of participants exhibited low levels of narcissistic traits at Time 1. Peer attachment (T1pa) was moderate to high (M = 3.8202, SD = 1.1399), suggesting that participants generally reported positive connections with their peers. Narcissism (T1narc) showed a low mean score, while the callous-unemotional traits (T1call, T1uncar, T1unem) were also relatively low on average. The callous traits (M = 1.0774, SD = 0.8344), uncaring traits (M = 1.6715, SD = 0.8830), and unemotional traits (M = 1.6698, SD = 0.9407) suggest that, on average, participants exhibit moderate low levels of these traits. The moderation analysis is being processed and the results will be reported at the conference.

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37. Exploring Masculinity in Singapore's Conscription Social Environment

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Singapore remains one of the few countries with universal male conscription, known as National Service (NS), where gay soldiers continue to face institutional stigma, including restrictions on their roles and classification within the military. Prior research has established the hegemonic masculine culture and systemic stigmatization of LGBTQ identities in NS. Yet, little is known about how queer men themselves make sense of their NS experiences. My study addresses this gap by asking: how do gay, bisexual, and questioning (GBQ) Singaporean men perceive their NS experience, and why do they frame it differently despite sharing a similar environment? Drawing on 15 in-depth, semi-structured interviews with GBQ Singaporean men aged 21–35 who have completed NS, I find that while all respondents encountered similar toxic masculine social environments, they varied widely in how positively or negatively they framed their experience. I introduce the concepts of 'expressive queers' and 'conservative queers' to show how respondents' orientations towards their sexuality shaped their expectations, interactions, and ultimately, their perception of NS. In particular, 'expressive queers' who saw their queer identity as central to their self-conception in NS and desired to express it, but were unable to do so in units they perceived as homophobic, framed their NS experience most negatively. In contrast, 'conservative queers' who did not see their sexuality as a defining aspect of their identity in NS and felt comfortable hiding it tended to perceive NS more positively, even in homophobic environments. My findings reveal a fundamental distinction in how queer Singaporeans conceive of their sexuality that potentially also shapes their interactions with heteronormative institutions beyond NS. More broadly, I contribute to sociological literature by demonstrating how personal attitudes toward a stigmatized identity shape experiences within the same institutional setting.

38. Novel Hyperpolarized ^{13}C Acyl Carnitines Probes for Assessing TCA Cycle Activity

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Hyperpolarized ^{13}C magnetic resonance spectroscopy (MRS) is an emerging molecular imaging technique that allows for the rapid, noninvasive, and pathway-specific investigation of dynamic metabolic processes *in vivo*. Unfortunately, only a limited number of hyperpolarized ^{13}C agents are currently available for the assessment of the tricarboxylic acid (TCA) cycle, which is a major contributor to the distinctive metabolic alterations found in cancer cells, known as the Warburg effect. In this area, probe development efforts have been stifled by the fact that TCA cycle intermediates (e.g., di- and tri-carboxylic acids) lack sufficient permeability and thus are not readily metabolized during the hyperpolarized MRS experiment time frame (1–3 min). To address these issues, this investigation focused on the design of acylcarnitine-based probes that can be transported into the intracellular environment, followed by the integration of the acyl moiety into the TCA cycle. Synthetic studies were performed to yield agents with varying acyl groups, and validation has been performed with ^{13}C-acetylcarnitine. Overall, these analyses provided a platform for the assessment of the agents and the selection of a lead probe that can be translated to hyperpolarized ^{13}C investigations. In turn, these novel TCA cycle probes have the potential to directly examine the Warburg effect and thereby provide unique insight into the metabolic profiles of tumors.

39. Differing Perceptions of the Stereotypes About Disabled People Between Disabled and Non-Disabled People

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This study examines if the perception of disability stereotypes differs between people with disabilities (PWD) and people without disabilities (PWOD). Disability stereotypes have been studied in prior literature mainly from the view of PWOD, but making a direct comparison will allow us to see if their perception is accurate to what PWD experience. Participants (n = 538) were asked what they think society thinks of disabled people in different ways. There were two open-ended measures: (1) One that asked people to provide 1-2 word phrases they thought encapsulated society's views about PWD and (2) an optional interview. In the quantitative measure, people were asked to rate how positively/negatively society thinks of PWD on a 1-7 scale across a list of traits from stereotype literature. Finally, we asked if participants would be willing to hire somebody with a disability for a client-facing role. We analyzed the data by splitting the responses based on whether the responder self-identified as having a disability. The phrases were analyzed through chi-squares and k-means clustering, and the quantitative measures were analyzed through ANOVAs and Tukey HSDs. We predicted that PWD would rate society's perception of PWD worse across the board than PWOD and that this difference would be largest in traits relating to warmth. We did find that PWD's perception of disability stereotypes was significantly more negative, but that the difference was not significantly greater for warmth-related traits. Additionally, we found PWOD were less likely to hire someone with a disability and more likely to report that disability was a concern when hiring them. These findings show us not only that there is a gap in understanding between PWD and PWOD on disability stereotypes, but also many details as to what that gap looks like which can be used to bridge it in future initiatives.

40. Bacterial Plastic Recycling at Scale: Evaluating the Tolerance of *Comamonas testosteroni* for Concentrated Plastic Waste

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In conventional mechanical recycling, plastic waste is melted, mixed, and extruded. As a result of the mechanical stress and heat, the plastic deteriorates in quality, becomes unusable after multiple recycling cycles, and must ultimately be disposed of. Polyethylene constitutes 40.6% of U.S. plastic waste generation [1], making it a particular target for alternatives to mechanical recycling. Biological recycling, where bacteria synthesize industrially valuable compounds from waste, presents an attractive alternative. The wastewater bacterium *Comamonas testosteroni* metabolizes dicarboxylic acids, a class of compounds derived from polyethylene [2]. However, the upper processing limits of this dicarboxylic acid metabolism remain unknown. To probe the dicarboxylic acid tolerance of *C. testosteroni*, we compared the behavior of *C. testosteroni* grown on dicarboxylic acids of carbon chain lengths four to 10 at various concentrations by measuring growth rates through optical density and cell growth through dry cell biomass. We found that *C. testosteroni* displays distinct tolerance behavior on even and odd chain length dicarboxylic acids. When grown on even chain length dicarboxylic acids, we observed no difference in growth rate across concentrations, indicating *C. testosteroni* was not negatively affected by increased concentrations. When grown on odd chain length dicarboxylic acids, we observed a decreased growth rate at higher concentrations but a final cell biomass proportional to the concentration, indicating *C. testosteroni* was slowed by higher concentrations but ultimately metabolized odd chain length dicarboxylic acids and fully applied the metabolic products toward cell growth. Taken together, our findings demonstrate the ability of *C. testosteroni* to process both even and odd chain length dicarboxylic acids at high concentrations without experiencing toxic effects. Our findings point to *C. testosteroni* as a promising platform for biological plastic recycling at an industrial scale.

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41. Exploring Low-Density and High-Density Water Populations Using Nuclear Magnetic Resonance (NMR) Spectroscopy

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Water is essential in biological processes, not just as a solvent but also plays critical roles in the function of biomolecules. The presence of two water populations with different densities, structures, dynamics, and hydrogen bonding properties has been theorized to impact biomolecular interactions. However, their existence has been challenging to experimentally measure, both because the signals from water molecules tend to be overwhelmed by the tremendous signal from the bulk (where water molecules only interact with themselves), and because the different populations likely undergo fast exchange. This project aims to explore methods to measure the two populations of water experimentally in bulk water using nuclear magnetic resonance (NMR) spectroscopy to lay down the foundation for investigating water-protein interactions in the future. NMR offers information on both the chemical environment and molecular dynamics of water. The change in chemical shift of ^{17}O nuclei in water highlights the change in molecular structure, while the changes in spin-lattice relaxation (T_1) rate and spin-spin relaxation (T_2) rates inform change in molecular tumbling rate. We evaluated these spectroscopic properties of water under a series of temperatures ranging from -15°C to 25°C with a special focus around 4°C (water's densest point). Detailed analysis of the line shape and relaxation of water NMR signals were carried out, which yielded intriguing results that could lead to advancements in our understanding of the structure of water in liquid state.

42. Navigating Dual Identities: Health Behaviors and Stress Management among 1.5- and Second-Generation Black Immigrants

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Black immigrants, particularly 1.5- and second-generation individuals, experience unique health challenges influenced by their dual cultural identities. The stress of balancing cultural heritage with American societal expectations impacts their health behaviors and stress management strategies. This study investigates how cultural factors shape stress coping mechanisms among this population, with the goal of informing public health interventions and policy recommendations that promote health equity.

This qualitative study utilizes focus group interviews with 1.5- and second-generation Black immigrants (ages 18-25) from African backgrounds, recruited through student organizations at the University of Illinois Chicago. The focus groups—both gender-specific and co-ed—explore stress management strategies through the PEN-3 Cultural Model, which assesses cultural influences on health behaviors. Data will be analyzed using Dedoose software to identify recurring themes.

Preliminary findings suggest that cultural identity plays a significant role in stress management, influencing coping behaviors and health decisions. Gender differences in stress perception and response are also anticipated, revealing distinct challenges faced by men and women. These insights will contribute to understanding how cultural frameworks impact health behaviors.

This research underscores the importance of culturally tailored public health interventions for Black immigrant communities. Findings will inform community advocacy efforts, healthcare initiatives, and policy recommendations to improve access to care and build trust within minority communities. By addressing health disparities through a culturally informed lens, this study contributes to broader efforts in health equity and policy development.

43. Mapping the Journey to Mental Health Accommodations in Academic Institutions

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Mental Illness (MI), when left untreated, can restrain the ability of students to be successful greatly. Effects include a lack of ability to pursue secondary education and a feeling of isolation from peers (NH Government, n.d.). As a result of this, the US government has implemented laws, such as the Americans with Disabilities Act, to ensure that students with MI's can get access to the accommodations necessary for success (Americans with Disabilities Act, 1990). The research conducted aims to better understand the accommodation process for students in higher education with mental illness. A preliminary review of college accessibility service websites was done in order to scan for usability elements. The pilot sample included 14 universities in the Midwest, with variance coming in the form of both type (e.g., public vs. private) and size (e.g., small, medium, large). After determining the barriers that students face, a journey map was created that details the steps that students take to implement their accommodations in higher education institutions. The process begins with a student who had no diagnosis and ends with implementation into the classroom. Difficulty in accessing navigating digital accommodation services in the digital space may limit a student's ability to seek help. A visualization provides the ability to better understand where systemic gaps may often occur. To better understand the impact of these facilitators, we will expand our study to include 25 total institutions by the CAURS annual meeting date. Further research is necessary to better understand the challenges, therefore leading to the ability to make a more comprehensive journey map visualization.

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44. Empowering School Staff to Support Newcomer Youth: Evaluating a Tier 1 Professional Development Training Across Occupations

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Newcomer youth face heightened stress and trauma from their migration experiences, increasing their risk for behavior and mental health issues. Schools offer a stable environment, early identification of difficulties, and integrated support services through preventative universal (Tier 1) mental health programs, thereby playing a crucial role in supporting youth mental health. School staff may require training to integrate universal supports for newcomer mental health through cultural orientation, community-building, and family engagement to help immigrant and refugee youth adjust and thrive in their new environments. However, we hypothesize that the effectiveness of school staff training in implementing these programs may vary by staff role. This study examined differences within survey data from a professional development training geared towards equipping all school staff to address newcomer mental health needs. 1,042 participants across 9 training sessions completed post-training Qualtrics surveys which assessed perceived information and skills learned (Knowledge), preparedness for their work (Preparedness), and satisfaction with the training (Satisfaction) on a 4-point Likert scale. These factors were compared based on the participants' occupations: administrators, educators, clinicians, and other school staff. Our methods of analysis included One-Way ANOVAs to compare the effects of occupation on knowledge, preparedness, and satisfaction ratings and post-hoc t-tests to assess specific differences between groups. The One-Way ANOVA results revealed significant differences across occupations. Clinicians reported lower perceived knowledge gains, preparedness, and satisfaction compared to educators, administrators, and other participants. These findings suggest that existing professional development trainings for Tier 1 program implementation may not sufficiently meet clinicians' needs, potentially due to higher baseline knowledge and preparedness levels from the nature of their occupation. Tailoring training adaptations to specific staff roles could bridge the gap in professional development effectiveness and engagement, equipping all school staff to support newcomer youth through Tier 1 school-based mental health programs.

45. Peer Attachment and Popularity Among Adolescents: The Mediating Role of Relational Aggression

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Popularity during adolescence may pose a challenging social barrier which involves the intersection between the desire for exclusivity and the need for broader peer connections [1]. This study investigated the longitudinal effects of peer attachment on popularity among adolescents and the mediation process of relational aggression and expected that peer attachment would be linked to reduced relational aggression, which in turn led to lower popularity. Participants were from the ages 11-15 in the United States. From the total participant pool *(N* = 569), the identified genders were female *(n* = 289) and male *(n* = 279), and identified ethnicities were White *(n* = 137), Black/African American *(n* = 146), Latino/a (*n* = 143), Asian (*n* = 106), American Indian/Alaskan Native (*n* = 20), and other (*n* = 17). Data was collected at three time points. The mediation was examined in SPSS PROCESS. The path from Time 1 peer attachment to Time 2 relational aggression was negatively significant (*B* = -.41, *P* = <0.05), indicating that more peer attachment has a negative effect on relational aggression. Moreover, Time 2 relational aggression was positively related to Time 3 popularity (*B* = .44, *P* = <0.05), while Time 1 peer attachment showed a negative effect (*B* = -.39, *P* = <0.05). These findings showed that relational aggression positively predicted popularity, while peer attachment showed the opposite effect. Furthermore, peer attachment showed a negative and significant total effect (Effect = -.57, *p* < .001) and indirect effect (Effect = -.18, 95% CI [-.26, -.11]) through reduced relational aggression on popularity. In all, these relationships highlight how adolescents' peer attachment is longitudinally linked to reduced popularity through the mediation of reduced use of relational aggression.

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46. PolyG Genotyping to Infer Tumor Heterogeneity

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Microsatellites are short, repetitive units of DNA base pairs that are ubiquitous across an organism's genome and are characterized by their high rates of insertions and deletions. As such, differences in the length of microsatellites across cells are indicative of cell lineage. Poly-guanine (polyG) sites are microsatellites that consist of multiple repeated guanine bases across the genome. They are particularly useful in analyzing cancer metastasis, tumor heterogeneity, and cell lineage due to their relatively high mutation rate, presence in many tissue types, and ability to remain agnostic to selective pressure. However, the usefulness of polyG analysis can be limited by noise and sequencing errors; in particular, the polymerase chain reaction (PCR) process required for amplifying DNA to sequence genomes introduces additional insertions or deletions. We create and validate a statistical model that estimates polyG length mutation probabilities, correcting for errors caused during the PCR process. Our computational method maximizes the likelihood of observing the polyG length data obtained from DNA sequencing. We found that our model fit non-cancerous samples well, and model parameters were consistent between biological replicates. This model is currently being used to develop a method for inferring tumor phylogenies from polyG sequencing data of colorectal cancers.

47. Characterizing a Peripheral Nerve Demyelination Model

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The myelin sheath surrounding axons functions as a protective insulator, enhancing the speed and efficiency of electrical signaling. Periodically, it is interrupted by small gaps called the nodes of Ranvier. These nodes are exposed to the extracellular membrane and densely populated with ion channels. This facilitates controlled ion exchange, generating action potential through rapid changes in membrane potential. Myelin allows signals to "jump" between nodes via saltatory conduction, accelerating signal transmission. As seen in demyelination disorders, loss of myelin disrupts this saltatory conduction, which impairs limb movement and strength. Current pharmaceutical methods such as small molecular pharmacology have limitations and side effects. Emerging evidence and computer modeling suggest a novel approach: restoration of nerve conduction through direct activation of the nodes of Ranvier in demyelinated areas. Here, to establish a mouse model of peripheral nerve demyelination, we performed a partial ligation surgery of the sciatic nerve in C57BL/6J mice and monitored mice for 14 days via immunohistochemistry (IHC), transmission electron microscopy (TEM) imaging, and behavioral tests. As time progressed toward 14 days, we hypothesized a reduction of proteins for myelin and axonal integrity, myelin layers, and performance in behavioral testing. Our integrated framework correlates protein expression, myelin integrity, and behavioral outcomes of walking gait and inverted hanging tests. Compared to the Control, we observed a significant reduction in myelin basic protein. After day 3, a trend in reduction of neurofilament on days 7 and 14 was observed. Transverse TEM imaging showed axons surrounded by myelin layers, known as lamellae. While Control mice had variable lamella counts, by day 14, both the variability and lamellae numbers decreased. The walking gait test assesses gait patterns, and the inverted hanging test assesses motor strength. Behavioral analysis is ongoing. The establishment of this mouse model prepares for therapeutic interventions to ameliorate focal demyelination disorders.

48. Apnea-Pressure Spike Index: Identifying OSA Specific Effect on Nocturnal Blood

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The apnea-hypopnea index (AHI) has variable prognostic value in predicting health outcomes in obstructive sleep apnea. We developed a novel index to quantify OSA-induced nocturnal hypertension. Methods: 60 participants with untreated moderate to severe OSA had nocturnal beat-to-beat Blood Pressure (BP) monitoring during polysomnography. The 3% hypopnea rule was used to score respiratory events. A method was developed to calculate the area under the curve for the blood pressure spike occurring with each respiratory event. The total area under the curve was divided by total sleep time in hours to derive each participant's Apnea-Pressure Spike Index (APSI). Morning fasting blood levels of high sensitivity C Reactive Protein (hsCRP), renin, angiotensin, aldosterone, epinephrine, and norepinephrine were collected. A morning assessment of vascular stiffness (pulse wave velocity; PWV and augmentation index; AIX) and endothelial function (vascular reactivity index; VRI) was completed. The sample was middle-aged (mean ± standard deviation, 44.9±9.3 years), 68% were men (41/60), AHI was 69.3±40.6 and body mass index (BMI) was 37.1±6.9 Kg/m2. The APSI for mean arterial pressure (MAP) was 33685.1±29061.2 mmHg*seconds per hour of sleep. APSI was positively correlated with hsCRP, aldosterone, and norepinephrine levels (Spearman's r = 0.29, 0.36, and 0.35, p-value = 0.04, 0.01, and 0.01, respectively). APSI was also highly correlated with AHI and hypoxia burden (r = 0.90, p<0.000 for each). We tested similar multivariable models using AHI and hypoxia burden as predictors of AIX. These indicators of OSA severity were not significantly associated with AIX. APSI was not associated with PWV or VRI. APSI is a novel OSA-induced nocturnal BP perturbation index associated with systemic arterial stiffness. APSI should be further evaluated as a prognostic biomarker for cardiovascular disease risk in OSA.

49. Examining the Impact of Asian Culture Values and Sacrifice Ideology on Perceived Social Support in Vietnamese Mothers

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Psychiatric disorders manifest differently across cultures. In Vietnam, research has shown that mothers disproportionately suffer from mental health problems compared to the general population. Moreover, Asian populations tend to endure mental distress and refrain from relying on their social network. Since social support is often vital to mental health, we sought to investigate factors involved in Vietnamese mothers' perceived social support. We hypothesized that believing in Asian values is associated with lower social support, and that this association is moderated by sacrifice ideology. We also sought to examine qualitative experience of mental distress and sacrifice ideology in motherhood. We administered surveys (N = 129) and conducted semi-structured interviews (N = 20) with Vietnamese mothers. Quantitative results indicated that within the Asian Values Scale, emotional restraint had the most impact on perceived social support, and that this relationship was significantly moderated by sacrifice ideology. Qualitative data analyses indicated that mothers found support in self-coping mechanisms rather than by seeking social support from their family members. Together these data suggest that Vietnamese mothers may consider self-reliance as a virtue, which might lower their expectations of social support from others.

50. To Belong or Not to Belong: The Black Male Perspective of Belonging at Northwestern

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Black men in higher education face persistent challenges related to representation and retention, particularly at predominantly white institutions (PWIs). Despite increased diversity initiatives, these efforts often fail to address deeper issues such as microaggressions, stereotype threat, and social isolation, which influence Black men's sense of belonging and academic persistence [1]. This study examines how institutional support systems at selective universities impact Black male students' experiences, using Northwestern University as a case study. Through 20–24 semi-structured interviews with Black male undergraduates, this research explores the complexities of academic and social belonging. A grounded theory approach will guide data analysis, allowing themes to emerge from participants' lived experiences rather than preexisting frameworks [2]. This qualitative methodology ensures that findings remain deeply rooted in the realities of Black students at Northwestern. Existing literature highlights the importance of cultural enclaves, mentorship, and student organizations in fostering belonging for Black men at PWIs. However, gaps remain in understanding how these students navigate both institutional and peer-driven support structures. This study aims to bridge that gap by identifying effective strategies for improving Black male retention and academic success [3]. As national policies shift away from diversity, equity, and inclusion (DEI) initiatives, understanding how selective institutions support—or fail to support—Black men is more critical than ever. Findings from this research may offer valuable insights into the potential consequences of diminishing inclusive practices and inform policies that promote equitable campus environments. By centering Black male voices, this study contributes to broader conversations on racial equity in higher education and offers actionable recommendations for fostering meaningful institutional change.

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51. Intraoperative detection of cancer spread to tumor-draining lymph nodes in patients with head and neck cancer.

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This project focuses on head and neck squamous cell carcinomas (HNSCCs), which are classified as a group of curative cancers that cause >300k deaths worldwide each year. Patients typically find this cancer as a solid tumor where, in most cases, complete surgical resection is the primary treatment and, assuming no spread of the disease outside of the primary tumor, is potentially curative. However, identifying whether the cancer is curative is a tedious process and involves a highly invasive neck dissection to screen all draining lymph nodes for the presence of satellite growths. This time-consuming process requires histopathology, including formalin fixation, paraffin embedding, microtomy, and staining with dyes such as hematoxylin and eosin (H&E). This process can take up to a week to complete and allows for <1% of the total lymph node volume to be sampled and screened. This is where our project comes into play; in aiding in the lymph node dissection, we have developed a metastatic lymph node model and a paired-agent widefield fluorescence tomography imaging protocol where we can rapidly identify the presence of Epidermal Growth Factor Receptor (EGFR) overexpressing human cancer cell aggregates as small as 300-micrometers in diameter. The project presented here aims to optimize the lymph node model, concentrations, timing of imaging agent infusion, and imaging and tomographic reconstruction protocols.

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52. Psyche of a Jazzwoman: Gendered Psychological Barriers to Jazz Participation

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One of the most influential musical genres in history, jazz has been predominantly male-dominated for much of its existence. Despite its roots in African American culture and its embrace of improvisation and individualism, the genre has historically marginalized women in all areas of the industry. While feminist movements have since brought some social progress on the gender equity front, gender discrimination continues to manifest itself in jazz today. To further understand what factors contribute to continued gender disparity in jazz today, I conducted a digital survey of over 200 adult musicians from across the country regarding their experiences with jazz. Analyzing this data through a psychological lens, I determined that female musicians appear to experience higher psychological barriers to jazz participation than their male counterparts, supporting anecdotal assumptions and my hypotheses. Across the board, tokenism, imposter phenomenon, stereotype threat, sexual harassment and assault, low self-efficacy, lack of self-efficacy building experiences, and negative feelings toward improvisation were all reported by a far higher percentage of female respondents than male respondents. Qualitative data further clarifies these quantitative results. I also examine current and potential solutions to the problem of gender disparity in jazz. This contribution of quantitative and qualitative data on this subject provides a valuable asset in optimizing solutions and moving the genre of jazz and other fields toward gender parity.

53. Circadian Regulation of Hypoxia Signaling in LKB1-Defficient Non-Small Cell Lung Cancer

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Approximately 20% of non-small cell lung cancer (NSCLC) cases exhibit Liver Kinase B1 (LKB1) inactivation, leading to dysregulated metabolism and stress responses [1]. This results in enhanced hypoxia-inducible factor 1α (HIF1α) activation, a key driver of tumor progression [2]. While this relationship is well-characterized in vitro, its circadian regulation in LKB1-deficient tumors remains unexplored. Given that circadian rhythms modulate hypoxic responses via BMAL1 and HIF1/2α [3], understanding their interplay in LKB1-deficient NSCLC is critical for identifying novel therapeutic strategies. This study investigates the temporal dynamics of hypoxia-driven gene expression in LKB1-deficient A549 cells and wildtype (WT) mouse lung tissue. We show that A549 cells lacking LKB1 exhibit elevated HIF1α and HIF2α levels after 6 hours of hypoxia, while LKB1 reintroduction reduces these factors. These cells retain intact circadian rhythms regardless of LKB1 status. We hypothesize that the magnitude of the hypoxic response is regulated by the circadian clock and is dependent on the time of day. To examine circadian regulation of hypoxia in vivo, we induced hypoxia via intraperitoneal injection of dimethyloxalylglycine (DMOG), a prolyl hydroxylase inhibitor that stabilizes HIF1/2α. Initial WT mouse studies optimized experimental parameters by injecting DMOG or PBS at ZT4 or ZT16, followed by quantitative PCR (qPCR) and western blot analysis to evaluate HIF1/2α target. Results show a greater hypoxic response at ZT16, correlating with BMAL1 expression and rhythmic HIF1/2α target gene expression, indicating circadian regulation of this process. Future studies will assess this clock-hypoxia interaction in a Kras/LKB1-deficient lung cancer model to determine whether LKB1 inactivation alters circadian control of hypoxia responses in tumors. These findings may inform chronotherapy strategies for NSCLC by leveraging circadian rhythms to optimize treatment timing.

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54. Gaze Characteristics Using a Three-Dimensional Heads-Up Display During Cataract Surgery

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Eye-tracking technology integrated with a three-dimensional heads-up display (HUD) offers a novel approach to monitoring gaze behaviors during surgery. Prior research in laparoscopy and radiology has demonstrated significant differences in visual search patterns between experts and trainees, yet limited literature exists examining these dynamics in ophthalmic surgery [1]. Therefore, this study aims to assess the relationship between surgical experience and gaze behavior during cataract surgery using real-time eye-tracking metrics. We conducted an IRB-approved, observational study at the Illinois Eye and Ear Infirmary involving 15 ophthalmologists across post-graduate year 2 (PGY2), PGY3, PGY4 residents, vitreoretinal fellows, and attending surgeons (n=3 per group). Participants were asked to perform key steps of cataract surgery on a SimulEYE model using an NGENUITY HUD, including continuous curvilinear capsulorhexis (CCC) creation and wound closure. Eye movements during surgery were recorded with a Pupil Core eye-tracker and analyzed for fixation duration, saccade length, and gaze distribution. Surgical proficiency increased with experience, with attending surgeons achieving the highest scores (54.67±0.58). Significant differences were observed between PGY2s and attendings in fixation durations (0.208±0.15 vs. 0.119±0.0024 seconds, P<0.01), saccade lengths (0.303±0.044 vs. 0.132±0.026, P<0.001), and proportion of fixations on the HUD (43.5%±0.115% vs. 77.54%±6.36, P<0.01). Capsulorhexis diameter increased with experience, with fellows and attendings achieving significantly larger diameters relative to lens capsule size (48.9%±9.2% vs. 12.14%±1.4%, P=0.03). Experts frequently starting proximal to the main wound and maintained smaller angles between the tear vector and forceps position, resulting in more controlled, circular tear morphologies. Moreover, experts rapidly alternated their gaze between the surgical instrument and surrounding ocular structures in a feed-forward eye movement, which is known to be a more efficient gaze pattern [2]. These findings highlight the evolution of visual-motor strategies with experience and the potential for eye-tracking integration in ophthalmic surgical education.

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55. Shaping the Gut: The Role of Socioeconomic and Household Environments in Microbiome Development Throughout Early Life

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The Philippines experiences some of the most pronounced health disparities in Southeast Asia, yet research on how socioeconomic status (SES) influences gut microbiome development in this region remains limited [1]. The human gut microbiome plays a critical role in human health, shaping immune function, metabolism, and disease risk [2]. An emerging field examines how SES interacts with environmental exposures to influence microbial diversity across developmental stages. This study hypothesizes that children from lower-SES households will exhibit lower gut microbiome diversity compared to those from higher-SES households, with SES-related factors influencing the pace of microbial maturation. Understanding this relationship is essential for addressing health inequities and identifying intervention points that may mitigate long-term health disparities. Using data from the Cebu Longitudinal Health and Nutrition Survey, 128 children, ranging from two weeks to 12 years old, across 83 households residing in Cebu, Philippines were investigated. Socioeconomic data, including household income and asset ownership, were collected alongside household data and microbiome samples to assess how SES and microbial exposure shape gut microbial composition in early life. Alpha diversity analysis using the Shannon index indicated that age was a statistically significant factor in microbial diversity ($p < 0.001$). Beta diversity analysis through non-metric multidimensional scaling (NMDS) ordination plots revealed a preliminary correlation between microbial composition and SES-related factors, such as familial income sources and maternal income. Further investigation using permutational multivariate analysis of variance (PERMANOVA) will refine our understanding of these relationships. These findings provide novel insights into the role of SES in shaping microbiome diversity throughout childhood and emphasize the importance of considering social and economic factors in microbiome research. By highlighting the intersection of environmental exposures, economic disparities, and microbial development, this study underscores the need for public health policies that address health inequities at their microbial roots.

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56. Effects of Upper Limb Priming on Lower Limb Spinal Neuroplasticity in Chronic Stroke Survivors

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Stroke rehabilitation remains a challenge due to persistent lower limb impairments that hinder mobility and independence. Approximately 2.5 million individuals in the United States continue to experience chronic motor deficits post-stroke, necessitating innovative rehabilitation strategies[1]. Stroke is one of the leading causes of long-term disability, with annual healthcare costs exceeding $33.9 billion[3]. Research suggests that inadequate functional recovery following a stroke can be attributed to disrupted neural connectivity between the two cerebral hemispheres[4]. Cortical priming techniques, which promote neuroplasticity and rebalance interhemispheric communication, have emerged as promising rehabilitation strategies[2]. While upper limb movements have been shown to influence lower limb function, their role in modulating spinal excitability remains unclear. This study investigates whether rhythmic upper limb movements can alter Hoffmann (H-) reflex responses, potentially reducing spasticity and improving motor control in individuals with chronic stroke. Twenty chronic stroke survivors participated in two experimental conditions: upper limb priming (UL-priming) involving rhythmic arm movements (drumming, boxing, arm swinging, rolling) and a sham priming condition with auditory stimulation. The soleus H-reflex, a measure of spinal excitability, was assessed via tibial nerve stimulation, with the Hmax/Mmax ratio serving as the primary outcome measure to gauge spinal H-reflex excitability. Hmax/Mmax was calculated by averaging both the three largest H-reflexes and the soleus's direct motor response, known as the M-wave. Results showed no significant differences in H-reflex excitability between conditions or time points, suggesting that the implemented upper limb movement paradigm did not effectively modulate spinal excitability. These findings highlight the need for further research to explore alternative movement paradigms or participant characteristics that may drive neurophysiological changes in stroke rehabilitation. Understanding the mechanisms underlying interlimb coupling could contribute to the development of targeted rehabilitation interventions aimed at improving motor recovery in stroke survivors.

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57. Defining Long Covid by Analyzing Binary Occurrence of Symptoms

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Long Covid is defined by the persistence or development of symptoms attributed to Covid-19 more than twelve weeks after initial infection. Since the outbreak of SARS-COV2 in 2019, it has been difficult for medical practitioners to accurately diagnose those with long covid syndrome due to a lack of consensus among the most distinct symptoms. Through analyzing survey data collected from 2021-2024 through the DePaul Symptom Questionnaire for Covid (DSQ-COVID) we analyzed how effective the occurrence of symptoms was at predicting a patient's diagnosis status as well as defining the most important symptoms for distinguishing this diagnosis. Surveys consisted of a Likert scale rating system of 0-4 for both frequency and severity for each symptom. We had three main strategies of analysis for this project: creating composite scores combining frequency and severity ratings for each symptom, analyzing frequency and severity ratings as separate symptoms and analyzing binary occurrence of symptoms. We defined occurrence as any frequency rating other than zero. We transformed our data to binary digits of occurrence (1= symptom did occur, 0 = symptom did not occur) and used this transformed dataset in order to run our analyses. We determined the most effective predictors by ranking them by their mean decrease in Gini value at each split within the forest over 20 trials. Using the Random Forest model with random bootstrapping sampling over 20 trials and an analyzing performance with an AUC-ROC curve, we were able to determine that we can create a model with a predicted accuracy of 92% using the binary occurrence of only 10 features. Further comparisons of our analysis of occurrence to our analysis using composite scores and focusing on frequency and severity as separate predictors determined we were not effectively able to discover the symptoms that can best define Long Covid.

58. Digital Barriers and Facilitators in Accessing Mental Health Accommodations

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The Americans with Disabilities Act (1990) and Section 504 of the Rehabilitation Act (1973) legally mandate that educational institutions provide accommodations for students with mental health conditions (Solovieva & Bock, 2014). These accommodations level the playing field for academic success among college students. However, the average number of students who register with their college's accessibility services is significantly lower than the average number of students who are eligible to do so (Morris et al., 2023). In recent years, access to accommodations in higher education has been digitized; however, legal requirements have not been updated with this shift, leading to fluctuations in the accessibility of accommodation services. We explored barriers and facilitators faced by college students who are seeking mental health accommodations. We conducted a preliminary review of college accessibility service website usability elements. Our pilot sample included 14 colleges in the Midwest region of the United States, varying in type (e.g., public vs. private) and size (small, medium, large). Through thematic analysis, we identified prominent barriers related to terminology, resource availability, and administrative processes. Prominent facilitators were related to navigation, comprehension, and specificity. Digital barriers may discourage students from seeking accommodations for their mental health conditions while digital facilitators may encourage accommodation-seeking among students. Reducing these barriers and optimizing these facilitators is critical in decreasing the gap between those who are eligible for mental health accommodations and those who receive them. To gain a more comprehensive understanding of the prevalence and impact of these barriers and facilitators, we plan to expand our study to include at least 25 institutions by the CAURS annual meeting date. This further research will expand our understanding of the challenges and facilitators faced by students and inform potential improvements to accessibility resources.

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59. Optimizing Hollow Fiber Filtration for Scalable Exosome Isolation From Bovine Milk

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Exosomes, a subclass of extracellular vesicles, have emerged as promising candidates for biomarker discovery and drug delivery due to their biocompatibility and ability to traverse biological barriers. However, their scalable and reproducible isolation from complex biological fluids remains a formidable challenge. This study systematically evaluates the influence of hollow fiber filter molecular weight cutoff (MWCO) selection on exosome isolation from bovine milk via tangential flow filtration (TFF), an advanced ultrafiltration technique with potential for large-scale bioprocessing. Filters with MWCOs of 300 kD, 500 kD, 750 kD, and 50 nm were assessed in terms of exosome yield, purity, particle size distribution, and processing efficiency. Nanoparticle tracking analysis (NTA), hydrophobic interaction chromatography (HIC), and dynamic light scattering (DLS) were employed to elucidate the physicochemical properties of the isolated exosome fractions. Among the tested MWCOs, 750 kD demonstrated optimal performance, yielding the highest exosome concentration with minimized protein contamination while maintaining reduced processing time. In contrast, filters with lower MWCOs retained excessive protein impurities, whereas the 50 nm filter, despite its rapid throughput, exhibited lower exosome recovery. These findings underscore the critical role of MWCO selection in optimizing exosome isolation and establish 750 kD as a viable parameter for enhancing purification protocols in translational and industrial applications. This study advances the standardization of exosome isolation methodologies, bridging the gap between fundamental research and scalable therapeutic utilization.

60. Impact of Relationship Gratitude and Self-Esteem on Perceived Stress Levels and Relationship Satisfaction in Low-Income Couples Facing Unemployment

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Unemployment can be difficult for romantic couples, impacting both mental health and relationship satisfaction. Low-income couples are more impacted by the financial stress of unemployment, and the protective effects of self-esteem and relationship gratitude may differ in this population underrepresented in this area of research [1]. These potential protective factors are particularly important because they can be improved through interventions [2,3]. If relationship gratitude and self-esteem play an important role in relational well-being during unemployment, clinicians could provide evidence-based strategies to enhance gratitude and self-esteem in help-seeking couples. I hypothesized that relationship gratitude and self-esteem will associate with higher levels of relationship satisfaction, and relationship gratitude and self-esteem will associate with lower levels of perceived stress. I surveyed 25 partners (11 complete couples) in low-income couples about their relationship satisfaction, perceived stress levels, self-esteem, and relationship gratitude. Participants were individuals who have been in a committed romantic relationship for at least 3 years, live together, and had at least one member of the couple unemployed for at least 3 months and seeking re-employment. Interested couples completed an online screening questionnaire, and eligible couples were invited to complete an initial virtual study appointment where they provided informed consent and completed a set of questionnaires. I assessed correlations between outcome variables of relationship satisfaction and perceived stress with predictor variables of self-esteem and relationship gratitude. I also examined mean scores of relationship satisfaction and perceived stress to compare couples with high and low self-esteem, and high and low relationship gratitude, using a median split. I found that relationship satisfaction was positively correlated with self-esteem and relationship gratitude, while perceived stress was negatively correlated with self-esteem and was not correlated with relationship gratitude. These findings suggest that improving self-esteem or relationship-gratitude in low-income couples may be helpful in the context of unemployment stress.

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61. Investigating Conditions and Potential Contamination of Urban Farms and Community Gardens in Chicago

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Black and Brown residents in Chicago have historically been disenfranchised and neglected. In particular, redlining and white flight have contributed to the lack of investment and the increase of dangerous exposure to pollutants from historical industrial activity. Urban farms and community gardens, meant to empower neighborhoods, are frequently established on abandoned lots that may contain contaminants. Soil samples were conducted of local Chicago urban farms and community gardens. If the results of the analysis show evidence of poor soil health then this would be consistent with the historical conditions of Chicago's agricultural space due to industrial activity and highlight community disparities.

62. How Northwestern Students Perceive Their Socioeconomic Status

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Increasing access to higher education is gaining traction as a political and social goal. Yet as it stands now, children's access to higher education is heavily influenced by their socioeconomic status or how educated their parents are, meaning colleges are increasingly wealthier. There exists plenty of evidence demonstrating that students of different socioeconomic backgrounds experience belonging, academic adjustment, social adjustment differently and will perceive class in varying ways. However, current research on belonging and socioeconomic status operates under the assumption that a student's self-perception of socioeconomic identity does not change, when research shows that changes in how people understand their identities can affect aspects of their wellbeing. This study, drawing on interviews from 16-20 Northwestern undergraduates students, aims to understand how, if at all, lower-SES, middle-SES, and upper-SES students have experienced a change in their perception of their own socioeconomic status after enrolling at Northwestern, an elite university with a high concentration of upper-class students. This study operationalizes SES as a combination of factors including household income, homeownership, parental education, and self-identity. Preliminary results suggest that students tend to unintentionally self-segregate into friend groups of similar economic standings, with lower-SES students justifying this in terms of underlying characteristics and upper-SES students attributing it to circumstance and shared interests. Additionally, lower-SES students, when entering an elite university with a high concentration of wealth, experience culture shock, but recount their own economic situations in terms of gratitude for current and future access to resources not typical of members of their community, as opposed to resentment for more fortunate economic circumstances.

63. Synthesis of a Di-Zinc Scaffold to Mimic the Active Site of Metallo-Beta-Lactamase Enzymes and Help Develop Novel Inhibitors

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Metallo-Beta-Lactamase (MBL) enzymes are a class of bacterial enzymes that break down antibiotics of the penicillin or carbapenem classes through hydrolysis. The genes that encode for these enzymes are one of the methods through which bacteria develop antibiotic resistance. A recent example is the New Dehli Metallo-Beta-Lactamase (NDM) gene, which is rapidly spreading around the globe. Inhibiting these MBL enzymes would turn off this route of resistance in bacteria, allowing clinicians to treat antibiotic resistant bacteria with standard antibiotics already available. These enzymes have two zinc atoms in the active site in close proximity to each other that catalyze the hydrolysis of penicillins and carbapenems. In order to better understand the chemistry of the di-zinc enzyme, we are synthesizing a small ligand framework that positions zinc atoms close together, similar to the enzyme active site. Using this framework, we then bind small molecule potential MBL inhibitors to the di-zinc core to understand how the inhibitors interact with the zinc atoms. The inhibitors we are synthesizing and studying are based on the 8-hydroxyquinoline (8HQ) core, and can bind strongly to two zinc atoms. The synthetic approaches, spectroscopy, and computational chemistry of these complexes are reported. Once inhibitor molecules that strongly bind the di-zinc core are identified, they can be sent to collaborators to test on NDM and similar enzymes using enzyme assays. This work represents an approach to drug design focuses on understanding metal-drug interactions.

64. Lung Cap2 Endothelial Cells Recover in the Absence of Epithelial Vegfa Postnatally

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Gas diffusion in the mammalian lung takes place in the alveoli, where a thin epithelium—primarily consisting of the expansive alveolar type 1 (AT1) epithelial cells—is enveloped by a capillary network. Recently, these capillaries have been shown to consist of two endothelial cell (EC) types - Cap1 and Cap2 cells. Cap1 cells are marked by PLVAP and represent P17 and the capillaries, while Cap2 cells are a smaller subset (~15%) marked by CAR4. Additionally, Cap2 cells exhibit unique web-like morphology, maintain close contact with AT1 cells, and are specified by epithelial-derived *Vascular endothelial growth factor A (Vegfa)*. We had previously shown that embryonic deletion of epithelial *Vegfa* resulted in the specific loss of Cap2 cells leading to vascular and alveolar simplification. Using immunofluorescence, we observed that these cells were able to be specified later in development, despite constitutive deletion of *Vegfa*, highlighting a mechanism for endothelial resilience. We are characterizing this observation across postnatal timepoints, and quantifying EC proliferation and alveolar simplification. Cap2 cells begin reappearing after two weeks of postnatal development and are very frequently found in the adult lungs of mutant mice. Endothelial proliferation occurs early on during development, but it is not associated with the increase in CAR4 staining and the recovery of Cap2 cells. Furthermore, the enlarged air spaces characteristic of alveolar simplification decrease over time, suggesting an improvement related to the newly formed Cap2 cells. In the future, we will dissect the mechanisms for endothelial resilience by performing single cell RNA-sequencing. This recovery highlights the significance of epithelial-endothelial interactions for vascular regeneration and survival, which can be of relevance in several pulmonary diseases characterized by vascular anomalies.

65. The Experiences of Younger Sisters of Eating Disorder Patients

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When a child develops an eating disorder (ED), the consequences of their illness can stretch beyond themself and their body. It can impact their parents, siblings, caretakers, friends, and other social relations. For siblings, the experience of watching the brother/sister experience their ED can be incredibly isolating. The reality for most siblings of ED patients is that they become explicitly secondary to their ill sibling as the rest of the family, especially their parents, rally around the patient and their survival. The experiences of siblings of ED patients often go unrecognized and unnoticed until after the patient receives treatment and is solidly on the path of recovery. These experiences have not been well documented in the extant literature. This study aims to understand the experiences of younger sisters who have had an older sister clinically diagnosed with an eating disorder while they were living in the same household. It focuses on the younger sibling's dynamics within their family, their relationship with their sister, and their own identity, mental health, and relationship with food. Data were collected through qualitative, semi-structured interviews with college-aged U.S. individuals raised as female with an older sister diagnosed with an eating disorder. Preliminary findings indicate that there are commonalities and trends among these participants. The experiences are characterized by distinct changes in their relationships with their sisters, a feeling of responsibility for their sibling's recovery, and an awareness of their own vulnerability with respect to developing an ED. These siblings of ED patients can report feeling incredibly isolated and confused. This study helps provide awareness to a group that is often overlooked during the treatment process for EDs. It can also provide a framework for considering the ways in which families, treatment facilities, and mental health professionals might better support this population.

66. Gaze Characteristics Using a Three-Dimensional Heads-Up Display During Vitreoretinal Surgery

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Vitreoretinal (VR) surgery requires complex visual and motor skills that are currently developed using didactics and simulation. Recently, gaze-tracking technology has emerged as a compelling tool to provide feedback on visual attention during surgical tasks. This study aims to investigate surgeon gaze characteristics and technical approaches during simulated VR surgery, analyzing their relationship with experience and surgical outcomes. Participants included PGY4 ophthalmology residents, VR surgery fellows, and attending VR surgeons (n=5 per group). Each were tasked to perform a trocar placement, core vitrectomy, epiretinal membrane peel, and sclerotomy suture on a Bioniko™ eye model. Gaze-tracking data was collected using a commercially available eye tracker. Experienced surgeons had more fixations ($p < 0.01$), shorter fixation durations ($p < 0.01$), and smaller saccades ($p < 0.01$), indicating a quicker assimilation of key surgical features. Qualitatively, experienced trainees tended to briefly anchor their gaze on points of high traction along the membrane edge before transitioning to adjacent areas, while novices displayed more fragmented gaze patterns. The integration of gaze-tracking technology in VR training protocols could help novice surgeons adopt the gaze strategies of more advanced individuals. Ultimately, more research is needed to create and train gaze models derived from experts to be used as a tool to enhance ophthalmic surgical education and improve patient outcomes.

67. Investigating Photosystem II Cyclic Electron Flow in *Chlorella*

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The desert-native, extreme light (2,000 µEin)-adapted green alga *Chlorella ohadii* expresses exceptional photosystem II photoprotection due in part to high levels of PSII-cyclic electron flow. This facilitates *C. ohadii* possessing the fastest recorded doubling time of any known phototroph, 1.4 hours, in high light and 2% CO2. When *Chlorella* NIES 642, a temperate, low light (20 µEin)-adapted alga, is subjected to the same growth conditions as *C. ohadii*, we have observed various changes to the PETC indicative of high PSII-CEF and recorded a minimum doubling time of 1.6 hours. In extreme light-grown NIES 642, PSII reaction centers do not fully saturate under conditions that can induce single turnovers in organisms as recalcitrant as *C. ohadii*. 77K fluorometry and chlorophyll extraction suggest this may result from extensive minimization of chlorophyll pigments; in extreme light conditions, the *C. ohadii* to *C.* NIES 642 chlorophyll ratio is 1.82 ± 0.18. Once acclimated, NIES 642 also shows various characteristics of high PSII-CEF on the acceptor side of PSII, including near-constant utilization of the plastoquinone pool (4.2 ± 2.5% performing no electron transfer) and a majority of centers with complexed to oxidized QB (59.7 ± 2.9%), opposed to semiquinone (35.1 ± 2.6%). P700 utilization monitored via Δ810nm absorbance illustrates that extreme light conditions greatly diminish charge separation at PSI, and *C. ohadii* expresses more PSI, comparatively. Electrochromic shift measurements of the thylakoid membrane show a diminished trans thylakoid proton gradient in the high PSII-CEF systems, strongly suggesting a large role of PSII CEF in optimizing ATP production.

68. Nuclear Envelope Proteins Regulate Endothelial Cells and Vessel Function

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As the innermost lining of blood vessels, endothelial cells (ECs) regulate blood flow, maintain vascular tone, and limit inflammation for vessel health. EC-derived nitric oxide (NO), synthesized by endothelial nitric oxide synthase (eNOS), is a vasodilator essential for improving blood flow and vascular homeostasis. We recently reported nucleoporin93 (Nup93), a crucial structural protein of the nuclear pore complex, as an essential player for EC health. These findings suggest a role for nuclear envelope components in the regulation of eNOS and vessel tone, a vastly unexplored contributor to vascular reactivity. Recent studies identify Sun1, a key component of the linker of nucleoskeleton and cytoskeleton (LINC) complex, as a regulator of EC cytoskeleton. We find that loss of Nup93 in endothelial cells (ECs) also leads to a decrease in Sun1 expression. Moreover, targeted loss of endothelial Nup93 is adult mice significantly reduces both eNOS and Sun1 levels. Notably, endothelial-targeted Nup93 mice exhibit decreased circulating NO levels and impaired NO-dependent vasodilatory responses. To determine the importance of Sun1, Nup93 knockdown ECs were infected with exogenous Sun1 protein. Restoring Sun1 protein levels in Nup93-deficient ECs rescues both eNOS expression and NO production to suggest a Nup93-Sun1 axis in eNOS regulation of eNOS. Taken together, we demonstrate endothelial Nup93 as a novel regulator of eNOS-NO signaling and vessel reactivity, contributing to the growing importance of nuclear membrane components in regulating EC and vascular biology.

69. Validating Generative AI Transformations for Lung Nodule Spiculation Characterization

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Spiculation—characterized by spiky or irregular lung nodule boundaries—is strongly correlated with malignancy yet remains a vital, underrepresented radiological marker in lung cancer screening. While deep learning models such as Variational Autoencoders (VAEs) can augment underrepresented classes in medical imaging, limited efforts have been made to validate or explain their generative transformations. Using the National Institute of Health/National Cancer Institute (NIH/NCI) Lung Image Database Consortium (LIDC), this study employs VAEs to extract high-dimensional latent representations of lung nodules and systematically transform non-spiculated nodules into spiculated ones by varying a parameter, alpha (0.1–3). To quantitatively validate this transformation, we introduce the Distance Convergence Hypothesis (DCH), which posits that as alpha increases, the Euclidean distance between transformed non-spiculated nodules and spiculated nodules decreases systematically indicating successful semantic alignment with spiculation-like characteristics. A baseline Euclidean distance is established by identifying statistical features such as mean and kurtosis that best differentiate spiculated nodules from non-spiculated ones. Two key metrics are defined: Pre-Transformation Distance, measuring the Euclidean distance between original spiculated and non-spiculated nodules, and Post-Transformation Distance, quantifying the distance between spiculated nodules and transformed non-spiculated nodules after their first transformation. This approach captures distributional shifts, assessing the effectiveness of the transformation in aligning non-spiculated nodules with spiculated characteristics. Initial results demonstrate a 14.8% reduction in Euclidean distance post-transformation, indicating meaningful convergence toward clinically recognized spiculation. By quantifying the resemblance of transformed nodules to spiculated nodules, DCH provides a robust framework for evaluating VAE-based models in medical imaging. Future work aims to extend DCH's applicability to additional lung nodule semantic characteristics, such as margin and texture, while incorporating deeper statistical analyses to enhance the reliability of generative transformations in computer-aided lung cancer diagnostics.

70. Don't Forget It! Conditional Sparse Autoencoder Clamping Works for Unlearning

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Recent developments in Large Language Model (LLM) capabilities have brought great potential but also posed new risks. For example, LLMs with knowledge of bioweapons, advanced chemistry, or cyberattacks could cause violence if placed in the wrong hands or during malfunctions. Because of their nature as near-black boxes, intuitive interpretation of LLM internals remains an open research question, preventing developers from easily controlling model behavior and capabilities. The use of Sparse Autoencoders (SAEs) has recently emerged as a potential method of unraveling representations of concepts in LLMs internals, and has allowed developers to steer model outputs by directly modifying the hidden activations. In this paper, we use SAEs to identify unwanted concepts from the Weapons of Mass Destruction Proxy (WMDP) dataset within gemma-2-2b internals and use feature steering to reduce the model's ability to answer harmful questions while retaining its performance on harmless queries. Our results bring back optimism to the viability of SAE-based explicit knowledge unlearning techniques.

71. Potential Effect of Polypharmacy on the Oral Microbiome with Age

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Improvements in health care, nutrition, lifestyles, habits, and safety practices, have led to increased numbers of the elderly in the US. With old age comes increased levels of systemic disease and usage of medication. Both endogenous and exogenous factors contribute to the aging process and in the oral cavity. The human microbiome changes with aging and may contribute to health declines seen with aging. Much evidence exists for this in the gut, with less known for the mouth. Strong links have been detected between aging and rates of periodontal disease and the nature of dental decay. The focus of this study is polypharmacy, the usage of multiple drugs to treat multiple diseases and conditions in an individual. Polypharmacy rates increase to high levels with age and are thought to contribute to oral pathology. We sought to determine if polypharmacy has reproducible effects on the oral microbiome in older patients. To conduct the methodology, an initial group of 55 older saliva donors was formed and controlled for levels of caries and periodontal disease, tobacco usage, and gender. Stimulated saliva was then collected and tested for levels of bacteria by 16S rRNA gene amplicon sequencing. Multiple variable analysis was done to determine taxa associated with increased medication needs. A second validation group in 2023 was tested using the same methodology. In this study, oral bacteria taxa were identified that are associated with polypharmacy in a population of older adults and validated in the 2023 group. Taxa thought to play a causative role in caries and periodontal disease were shown to be enriched with polypharmacy even after controlling for both diseases. The three bacterial taxa identified are candidates that suggest that polypharmacy may contribute to shifts in the oral microbiome that could negatively impact oral and overall health in aging populations.

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72. Respiratory Deficits Uncovered During the Six-Minute Walk Test in Children with Congenital Central Hypoventilation Syndrome

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Congenital Central Hypoventilation Syndrome (CCHS) is an ultra-rare disorder caused by PHOX2B gene variants that lead to impaired autonomic nervous system development and function. Individuals with CCHS lack normal responses to changing cardiorespiratory needs, putting them at risk of hypoventilation, hypoxia, and hypercapnia [1]. CCHS patients require lifelong assisted ventilatory support during sleep, with more severe cases requiring support 24-hour/day. To better understand disease progression, determine personalized treatment recommendations, and assess the impact of therapeutics, evaluating the physiological impact of exertion in spontaneously breathing children with CCHS is critical. This project investigates the Six-Minute Walk Test (6MWT), a standardized assessment of exertion with 2-minute baseline, 6-minute walking, and 2-minute recovery periods, in CCHS patients. We hypothesized that in CCHS, 6MWT would lead to an exaggerated decrease in blood oxygen saturation (SpO2), increase in end-tidal carbon dioxide (EtCO2), and diminished return toward baseline during recovery compared to controls. Six spontaneously breathing CCHS patients and six healthy controls participated. SpO2 and EtCO2 measures were recorded, averaged over 1-minute epochs, and percent change from baseline was calculated during the walk and recovery periods. Despite similar baseline values, during both the walking and recovery periods, CCHS SpO2 levels were lower and EtCO2 levels were higher than levels observed for controls ($p<0.05$). Regarding SpO2, none of the CCHS subjects recovered to baseline in 2 minutes compared to 5/6 controls, and recovery toward baseline was significantly less in CCHS compared to controls ($p<0.05$). For EtCO2, no CCHS subjects recovered to baseline in 2 minutes compared to 3/6 controls, and recovery toward baseline was also significantly less in CCHS compared to controls ($p<0.05$). Using a standardized outcome assessment, this study identified specific exertion-related deficits in CCHS patients, indicating the potential of the 6MWT to serve as an outcome assessment in future therapeutic trials and clinical decision making.

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73. Bioinkjet Printing and Protein Tagging of Camouflaged and Biosafe QR Codes for Medicine Authentication

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Online pharmacies and social media platforms are responsible for the growing presence of fake and counterfeit medicines, and the verification and authentication of dosage levels are imperative for protecting individual medicines. However, the existing anti-counterfeit methods for medicines and exterior box-level protection are lacking, and they focus on pharmaceutical supply chains instead of empowering patients. In this study, we introduce camouflaged biosafe quick response (QR) code bioprinting and taggant construction for on-dose (or in-dose) medicine security, integrated with the dosage form. Machine-readable color QR codes contain concealed invisible patterns with biologically safe near-infrared absorption properties, which help enhance the security of conventional QR codes. The reported bioinkjet printing and protein-tagged construction approach guarantees printability, imperceptibility, stability, biocompatibility, digestibility, and tamper resistance, which are inherent components of each unit of medicine in their solid dosage formats. Camouflaged biosafe QR code taggants can offer various medical security applications including anti-counterfeit measures, authentication features, track-and-trace, and serialization at the dosage level. This approach is expected to empower patients to play an active role in fighting illicit medicines and pharmaceutical products.

74. Uveal Melanoma and Prostate Cancer

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Uveal melanoma (UM) is the most common intraocular malignancy in adults and is associated with a poor prognosis. Prostate cancer is also a common cancer and commonly metastasizes and metastases by other cancers. Both UM and Prostate cancer are prevalent in the United States. This study aims to investigate the relationship between prostate cancer diagnosis rates and uveal melanoma tumor characteristics in the presentation. A retrospective chart review of patients at the University of Illinois Hospital diagnosed with uveal melanoma between 2010 and 2023. Patient demographics (based on patients' zip codes) and tumor characteristics were collected. Zip code data was collected to find prostate cancer diagnosis rates per patient. Bivariate and logistic regression were used to assess the association between tumor characteristics at presentation and prostate diagnosis rates as calculated from the patient's zip code. Upon analysis, a higher prostate cancer diagnosis rate is associated with a higher tumor volume (p=0.084). 142 patients from the chart review had information regarding prostate cancer and diagnosis. The average prostate cancer diagnosis rate per zip code was 144.2 per 100,000 males. Previous studies indicate a mutation in the BRCA 1 or 2 gene puts individuals more at risk for developing cancers such as prostate cancer. The evidence that UM and prostate cancer arise simultaneously in many patients might indicate the BRCA gene is related to UM. Relationships between risk factors, such as age, present similarities, which might indicate a nonhereditary confounding variable between the cancers. Further research is needed however to understand the relationship between the cancer types.

75. Holographic Entanglement Entropy in Non-Commutative Theories

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The AdS/CFT duality is a holographic relation between a gravitational theory in an Anti-deSitter (AdS) spacetime and a conformal field theory (CFT) which is defined on the conformal boundary of the AdS space. This relation asserts that observable quantities in both theories can be related thermodynamically through what is called an AdS/CFT dictionary, which allows for highly difficult problems in one theory to be reframed in a more manageable form. The calculation of entanglement entropy, which is a measurement of the quantum correlation between subsystems, is often challenging using traditional quantum field theory (QFT) techniques. While holographic methods of calculating entanglement entropy have been well studied (see [1]), applying these methods to non-commutative backgrounds presents novel challenges due to the fact that position coordinates on the boundary may not necessarily commute with each other. This non-commutativity manifests in our AdS spacetime as an additional term in the metric, which describes the spacetime, and limits the precise definition of a space-like surface. Despite this limitation, following the work of Fischler et. Al. [2], we are able to calculate entanglement between separated strips within a defined region of validity. We accomplish this by minimizing the area of surfaces in our AdS space that correlate to entangled regions on the boundary, performing the final non-analytic integrals through Wolfram's Mathematica. We find that increasing the non-commutativity of the AdS spacetime increases the maximum distance at which our strips can be correlated. Additionally, introducing temperature into our system through a black hole at the center of our AdS spacetime induces a thermal phase transition in the entanglement entropy.

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76. When Caring Takes Its Toll: Psychological Hardiness as a Buffer Against Compassion Fatigue

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Healthcare workers face high levels of stress, particularly when providing care to trauma patients, often leading to compassion fatigue which represents a significant occupational hazard. While research has documented associations between compassion fatigue and adverse mental health outcomes, less attention has been given to potential protective factors. This study examines whether psychological hardiness buffers against the effects of compassion fatigue on anxiety, depression, and posttraumatic stress. We collected cross-sectional survey data from United States healthcare workers (N = 200). Using negative binomial regression models, we examined if psychological hardiness moderates the relationship between compassion fatigue and mental health symptomatology, controlling for age and gender. In main effects models, greater compassion fatigue was associated with worse anxiety (RR = 1.03; 95% CI: 1.02, 1.05; p < 0.001), depression (RR = 1.05; 95% CI: 1.03, 1.06; p < 0.001), and posttraumatic stress (RR = 1.08; 95% CI: 1.06, 1.11; p < 0.001). There was a statistically significant interaction between compassion fatigue and psychological hardiness on posttraumatic stress (RR = 1.01; 95% CI: 1.01, 1.01; p = 0.014) and a trend-level interaction on depression (RR = 1.01; 95% CI: 1.00, 1.01; p = 0.058), suggesting psychological hardiness buffered the effects of compassion fatigue on these outcomes. No interaction was found for anxiety. These findings suggest psychological hardiness may serve as an important protective factor against adverse mental health effects of compassion fatigue among healthcare workers, particularly for depression and posttraumatic stress symptoms. Results highlight the value of hardiness-focused interventions in healthcare worker wellness programs to enhance workforce resilience and mitigate the mental health burden associated with compassion fatigue.

77. Mindscapes: The Intersection of Art, Brainwaves, and Robotics

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This research explores the intersection of science, robotics, and the arts by developing a brain-controlled painting system using an electroencephalogram (EEG)-based brain-computer interface (BCI) linked to a robotic arm. The purpose of this study is to investigate how neural activity can be translated into brushstrokes, redefining artistic expression for individuals with motor impairments while advancing assistive technology and therapeutic applications [2].

The hypothesis guiding this research is that EEG-based BCI can enable real-time control of a robotic arm for painting, allowing users to create art through thought alone [1]. To test this, the study employs a structured experimental approach involving system integration, prototype development, user testing, and refinement.

Preliminary findings indicate that EEG-based BCI can successfully control a robotic arm for basic directional movements and stroke modulation. Early user trials reveal a learning curve in mastering neural commands, but adaptive machine learning algorithms improve accuracy and responsiveness [3]. These results support the feasibility of thought-controlled robotic painting and highlight the potential for improving user accessibility through iterative system enhancements.

The major conclusions suggest that BCI-controlled robotics can significantly contribute to human-computer interaction and inclusive design. The research findings will be presented at academic conferences and innovation showcases, with potential applications in interactive installations and brain-controlled gaming. By bridging cognitive processes and creative action, this project challenges traditional artistic models and expands the possibilities for human expression through BCI technology.

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78. Analyzing C9orf72 Dipeptide Proteins on Aurora B Kinase Expression in ALS Neuronal Degeneration

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Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disorder that results in the degeneration of upper and lower motor neurons, leading to muscle weakness, atrophy, and respiratory failure. A familial form of ALS is caused by a mutation in the C9orf72 gene, which results in the expansion of a nucleotide sequence that produces toxic dipeptide repeat proteins. Aurora B kinase is a kinase involved in cell division and spindle stability. It has also been shown to potentially be involved in neuronal processes. Given its critical role in these processes, this study aims to investigate the impact of these toxic dipeptides on Aurora B kinase to determine if they play a role in the development of neurodegeneration in ALS. While its involvement in ALS remains unclear, our goal is to observe whether the function of Aurora B kinase is affected in primary neurons expressing the C9orf72 dipeptides. To explore this, expression plasmids expressing the dipeptides were transfected into primary cortical and motor neurons. The neurons were subsequently fixed, stained, and imaged to assess changes in neurite length and nuclear size. These results were compared across the different dipeptides, as well as with a control group of cortical neurons without the dipeptides, to determine the effects on neuronal health and Aurora B kinase function. Our results suggest that there is a significant change in Aurora B kinase expression in neurons expressing the C9orf72 dipeptides, indicating that it could possibly having l role in ALS progression. Our findings could provide valuable insights into the role of Aurora B kinase in the progression of ALS.

79. ipRGC Subtypes and Projection Patterns in the Opn4-FlpO Mouse Model

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For 150 years, scientists believed that only rod and cone photoreceptors were light sensitive. However, in the later part of the 20th century scientists discovered a new kind of photoreceptor called Intrinsically Photosensitive Retinal Ganglion Cells (ipRGCs). ipRGCs are photosensitive because they express a photopigment called melanopsin (gene name Opn4), which makes them able to respond directly to light (i.e., intrinsically photosensitive). ipRGCs are responsible for carrying out many 'non-image forming behavior' such as circadian photoentrainment (light/dark cycle) and the pupillary light reflex and are also involved in contrast sensitivity for visual perception. Even though there has been extensive research on ipRGCs, the mechanism of each ipRGC subtypes and the extent that each ipRGC subtype contributes to visual behavior remains unknown. To address this gap, the Schmidt lab created an Opn4FlpO mouse model to genetically isolate individual ipRGC subtypes. The goal of my project was to characterize and validate the Opn4FlpO mouse as a new genetic tool for use in future intersectional approaches to target single ipRGC subtypes. To validate this line, retinas and brains were dissected, immunohistochemistry was performed, and ipRGCs were imaged and counted. A major conclusion is that it was observed on the confocal microscope ipRGC brain projections to suprachiasmatic nucleus (SCN), olivary pretectal nucleus (OPN), peri habenula (pHb), intergeniculate leaflet (IGL), dorsal lateral geniculate nucleus (dLGN), ventral lateral geniculate nucleus (vLGN), and superior colliculus (SC). Interestingly, it was found that the virus injection of the Opn4FlpO mouse model had a lower number of total ipRGCs compared to using mouse genetic approach. Furthermore, Opn4-FlpO is mainly expressed in M1s to M3s with very little expression in M4s. This work helps contribute to ipRGC and neuroscience studies, which is to understand the mechanism of single subtypes of retinal ganglion cells and nonimage forming behavior.

80. The marine paleoecology in Kansas during the deposition of the middle part of the Upper Cretaceous Jetmore Chalk based on fossil fish remains.

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The Jetmore Chalk Member (lower Turonian) of the Greenhorn Limestone is a sedimentary rock unit deposited under the Western Interior Seaway of North America during the Late Cretaceous. The upper part of the Jetmore Chalk is known to contain remains of diverse marine vertebrates, but the fossil record of other parts of the stratigraphic member is poorly known. In this study, vertebrate composition in the middle part of the Jetmore Chalk in west-central Republic County, Kansas, USA, was examined through surface collecting in the field and acid treatment of samples in the laboratory. The taxa identified consist of at least four chondrichthyan (*Ptychodus* cf. *P. whipplei*, *Cretoxyrhina mantelli*, *Squalicorax curvatus*, and Batomorphii indet.) and ten osteichthyan fishes (cf. *Hadrodus* sp., Caturidae(?) indet., non-teleostean Actinopterygii indet., *Pachyrhizodus minimus*, Ichthyodectiformes indet., Plethodidae indet., *Enchodus gladiolus*, and *E. shumardi* and at least two other types of teleosts). Whereas isolated teeth of Caturidae(?) indet. represent the most abundant vertebrate remains in this study, the collection also includes remains of several isolated placoid scales of Selachii indet. and small phosphatic pebbles representing coprolites of indeterminate species, with at least one specimen containing fragmentary teleostean bones as inclusions. The diversity of fishes was high at this location during the early Turonian, evidenced by the range of species occupying different trophic levels, from small pelagic bony fishes (e.g., Caturidae(?), plethodidae, and *Enchodus*) to large macrophagous (*Cretoxyrhina* and *Squalicorax*) and durophagous (*Ptychodus*) sharks. This study represents the first examination of fossil vertebrates from the middle portion of the Jetmore Chalk, which has revealed that the overall taxonomic composition of the assemblage is largely consistent with the upper part of the Jetmore Chalk. This observation suggests that the ecosystem during the deposition throughout the middle–upper part of the Jetmore Chalk was relatively stable and ecologically complex.

81. Predicting Employees' Remote Work Preferences: Disruption, Organizational Support, and Positive Transformation During the COVID-19 Pandemic

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The COVID-19 pandemic led to a widespread shift to remote work, transforming employees' experiences and influencing their current workplace preferences. This study examines how disruption to routine and perceived organizational support (POS) during the transition to remote work influenced employees' experiences of positive transformation and their subsequent policy preferences for remote, hybrid, or in-person work. We hypothesized that greater disruption would be associated with greater positive transformation, particularly for employees who perceived high organizational support, and that positive transformation would predict support for remote work policies. Using a two-wave survey of 261 employees across various industries, we measured disruption, POS, positive transformation, and remote work policy choices, supplemented by qualitative thematic analysis. Results indicate that POS, but not disruption, significantly predicted positive transformation, which in turn influenced employees' preference for more remote-friendly work policies. Thematic analysis highlighted key areas of positive transformation, including work-life balance, flexibility, and reduced commuting time, as well as challenges such as isolation and blurred work-home boundaries. Notably, employees who experienced greater positive transformation were more likely to advocate for remote work policies, with flexibility emerging as a central theme in policy justifications. These findings emphasize the critical role of organizational support in shaping employees' adaptation to remote work and suggest that flexible work arrangements may enhance employee satisfaction and organizational trust. Future research should explore the role of managerial support and industry-specific differences in remote work experiences.

82. Binding and Mobility of Bioactive Peptides on Peptide Amphiphile Nanofibers Measured by Nuclear Magnetic Resonance Spectroscopy

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Inhibition of specific receptors by membrane-permeable peptides has been shown to be effective at promoting axonal growth in animal models of spinal cord injury [1, 2]. The Stupp Laboratory has recently developed a supramolecular system in which bioactive peptides bind electrostatically to the surface of supramolecular peptide amphiphile (PA) nanofibers. This strategy is particularly attractive because the binding of peptides to PA nanofibers may prolong the lifetime of these molecules and enable fine-tuning of supramolecular motion, which has been shown by the lab to increase the bioactivity of some signals. Current insights indicate degrees of peptide mobility on nanofibers correlates with measured bioactivity *in vitro*. P-PA supramolecular interactions likely determine the regenerative potential of the system, yet these interactions are poorly understood. We hypothesize that enhanced association of peptide to nanofibers correlate with enhanced neuroregenerative potential. To test this hypothesis, we investigate here the binding and translational motion of four different peptides associated with supramolecular PA nanofibers using multiphase and multinuclear nuclear magnetic resonance (NMR) spectroscopy. Solution-phase ^{1}H NMR of all four peptides revealed sharp peaks consistent with high molecular mobility. In contrast, spectra of the peptides mixed with the PA nanofibers showed a significant loss of peptide signal, indicating severely decreased peptide motion. We then turned to high-resolution magic-angle spinning (MAS) NMR to study the peptides in this semi-solid phase, where we anticipated visibility of solution-NMR-invisible peptide signals. This yielded data on naturally occurring ^{1}H spins and ^{13}C cross-polarization NMR for solid-phase analysis. We anticipate these techniques will enable the investigation of supramolecular motion and interactions. Linking the structure and mobility of peptides on nanofibers with their bioactivity *in vitro* will aid in future design of enhanced regenerative medicine. Understanding the structure-dynamics-function relationships in these systems will help guide the design of supramolecular assemblies with enhanced bioactivity.

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83. Global Pattern Avoidance in the Type B Coxeter Groups

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A new notion of global pattern containment has recently emerged in the mathematical field of permutation pattern avoidance which studies the useful theory of sub-patterns in various types of restricted arrangements. Unlike classical pattern containment which looks for signed permutations embedded in signed permutations, global pattern containment identifies unsigned permutations discreetly embedded in signed permutations. We naturally explore enumerations of the signed permutations which don't globally contain certain patterns to find pleasant results, interesting bijections, and unexpected set equivalences. We explore how the work of previous authors beginning in 2004 can be reformulated into global pattern avoidance and classify the global avoidance of a size 3 pattern and size k increasing/decreasing subsequence. We then use the few theorems presented to classify a great variety of algebraic, qualitative, and more enumerative results. We then explore when global pattern containment is equivalent to classical signed pattern containment and how the notions diverge. Permutations arise naturally and frequently, and the permutations avoiding a particular set of patterns often carry a deep connection to interesting mathematical objects. Particularly, we examine the extreme effects of global pattern avoidance as the classification of algebraic certain objects such as Boolean and Vexillary permutations. We conclude with a discussion of how the global and classical pattern notions compare at succinctly classifying some of these mathematical objects.

84. The Use of Tissue Microarrays to Study the Role of Selenoproteins in Cancer

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Prostate and breast cancer are among the most frequent cancers worldwide. We hypothesize that certain selenium-containing proteins or selenoproteins become altered in these tumors and influence the risk or progression of the disease. There is an observed lack of correlation between the SELENOF selenoprotein and its mRNA levels in human prostate cell lines suggesting post-transcriptional regulation. Because selenoproteins are heavily regulated at the level of translation, tissue microarrays (TMAs) can be used to efficiently analyze multiple patient tissue samples simultaneously for several proteins and compared to clinical data. To address the roles of certain selenoproteins in prostate cancer, samples from patients who underwent radical prostatectomies were obtained from the UIC Biorepository to generate a prostate TMA. SELENOF levels were significantly decreased and eIF4a3 was over-expressed in tumor tissues compared to adjacent benign tissues. Analyses revealed an inverse correlation between SELENOF and eIF4a3 expression in prostate cancer tissues. eIF4a3 is an RNA-binding protein involved in RNA splicing and translational control of selenoproteins. Under low selenium conditions, increased eIF4a3 levels hinder the translation of selenoproteins like glutathione peroxidase 1 by binding to its RNA, and this observation has been extended to SELENOF where its binding to SELENOF mRNA reduces SELENOF [1]. In contrast, analysis of a breast cancer TMA generated consisting of 141 cases collected at University of Illinois at Chicago revealed that levels of both SELENOF and eIF4a3 were higher in breast tumor tissues compared to adjacent benign tissues. Elevated SELENOF and eIF4a3 seen in breast cancer tissues while lower levels of SELENOF occurring in prostate cancer may indicate different roles or regulatory mechanisms for SELENOF in different types of tissue. However, since eIF4a3 is elevated in both cancer types, inhibiting eIF4a3 may be a potential new strategy for breast and prostate cancer treatment.

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85. Antiaromatic Polymer Synthesis for Organic Electronic Applications

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From organic photovoltaics to field effect transistors, antiaromatic conjugated polymers are promising candidates for applications in organic electronics. The delocalization of electrons in conjugated polymers gives rise to electronic properties like semiconductor behavior and strong light-matter interactions. The antiaromatic nature also makes these molecules more conductive and soluble. However, due to their instability, antiaromatic polymers have proved challenging to synthesize and have not been produced on a significant scale despite their favorable properties [2]. Therefore, this project focuses on developing scalable routes to antiaromatic polymers using palladium-catalyzed catalytic norbornene annulation (CANAL) and photopolymerization. The project aims to optimize the methods for synthesizing antiaromatic polymers and characterizing the molecules to see if they possess the theorized properties of lower bandgap, higher conductivity, and less aggregation. The CANAL methodology couples a norbornene or oxynorbornene to an aryl halide, forming a molecule containing an unsaturated four-membered ring. After acidic dehydration, the resulting structure is an antiaromatic cyclobutadienoid [1][3]. The Kalow lab recently discovered that aryl Grignard monomers can polymerize using visible light, allowing access to electron-deficient conjugated polymers that are difficult to synthesize by traditional methods. The benefit of this method is that it avoids the use of transition-metal catalysts, which can result in charge sinks even in trace amounts and are difficult to remove, reducing charge transport properties. In the light polymerization process, light stimulates a chain growth mechanism by exciting antiaromatic oligomers from their ground state to an excited radical anion state. Nuclear magnetic resonance (NMR) analysis confirmed the successful synthesis of an antiaromatic monomer using the CANAL and anti-aromatization methodologies. The resulting product demonstrated stability for several days, allowing time for some characterization. With access to an antiaromatic polymer, the next phase of this project will focus on optimizing the monomer synthesis pathway and investigating the photopolymerization of the resulting products.

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86. Synthesis, characterization, and catalytic testing of dilute copper-based plasmonic nanoparticles for propane dehydrogenation

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Industrial processes accounted for 24% of greenhouse gas emissions in 2020[1]. This statistic is directly related to the fossil fuel dependence of the chemical industry. Societally relevant processes such as propylene production can require extreme temperatures and pressures, contributing to the large carbon footprint of the industry. To make conditions less harsh and reduce emissions, alternative methods, such as photocatalysis and electrocatalysis, have been explored. This work centers on the light-driven gas phase formation of propylene from propane, using plasmonic copper nanoparticles doped with a small concentration of a catalytically active metal (platinum, rhodium) in various concentrations. Nanoparticles are similar in magnitude to the wavelength of light, giving them important optical properties, such as localized surface plasmon resonance (LSPR). Nanoparticles were synthesized using the strong electrostatic adsorption (SEA) synthetic method. SEA leverages the point of zero charge (PZC) of nanoparticulate silica to form negatively charged sites on the surface, to which positively charged metal ions in solution electrostatically adsorb. After reduction at 350°C under hydrogen, the formation of 3nm nanoparticle alloys was observed with transmission electron microscopy. Diffuse reflectance UV-visible spectroscopy (DRUVS) characterization identified the LSPR of the optically active material. Diffuse reflectance Fourier Transform Infrared spectroscopy (DRIFTS) confirmed the nature of the dopant metal sites on the surface of the Cu nanoparticles (single atom vs. ensembles of dopant metal). Inductively coupled plasma-optical emission spectroscopy (ICP-OES) determined the exact composition of samples. These samples were tested catalytically and showed significant increases in propylene production rates between 400-520°C in the light vs dark conditions. This enhancement was observed most drastically for samples with single atom dopant sites and for platinum-doped samples compared to rhodium-doped samples. This work sets the foundation for understanding how dopant identity and concentration in dilute copper alloys affect light enhancement in plasmon-assisted direct propane dehydrogenation.

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87. The Role of Nuclear Yap Protein in Nup93-BMP4 Regulation

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Endothelial cells (ECs) make up the innermost lining of the vasculature and are frequently subject to inflammation. As a result, maintenance of endothelial health is crucial to prevent age-related vascular disease. When cells age or enter a state of senescence, nuclear pore complexes, or NPCs, undergo degradation. Nucleoporin 93 (Nup93) is a critical component of the NPC that has recently been shown to decline with age in ECs to suggest a role for NPCs in vascular health. We find that loss of Nup93 leads to the nuclear accumulation of Yap, a transcriptional cofactor known to trigger EC inflammation and vascular disease [1]. Moreover, Yap activity has been found to induce the expression of Bone Morphogenetic Protein 4 (BMP4), a cytokine associated with human aging. Intriguingly, we find that loss of Nup93 also leads to a significant increase in BMP4 to suggest a role for Yap activity in Nup93-mediated mechanisms of BMP4 regulation. To test this, we introduced Yap inhibitors in Nup93-deficient ECs in an attempt to reduce BMP4 levels to healthy controls. Collectively, these findings demonstrate that Yap accumulation as a consequence of Nup93 depletion disrupts endothelial function, and the increases in BMP4 expression depend on Yap transcriptional activity.

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88. Impact of Notch4 Blockade on Macrophage Recruitment to the Breast Tumor Microenvironment

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The Notch signaling pathway is a highly conserved pathway involved in tumor angiogenesis. Notch4 is primarily expressed in the tumor endothelium, and high levels of Notch4 expression are associated with poor survival in breast cancer. In mice, loss of Notch4 from the tumor stroma reduces mammary tumor angiogenesis, perfusion, and volume. We found that treatment with a novel anti-Notch4 neutralizing antibody, E7011, reduced tumor growth and caused a significant increase in the number of tumor-associated macrophages (TAMs). We depleted TAMs with liposomal clodronate, which abrogated the ability of E7011 treatment to reduce tumor volume and suggested that TAMs are an important player in E7011 efficacy. Although Notch4 is mainly expressed on the endothelium, our flow cytometry data revealed that Notch4 is also expressed in ex vivo activated macrophages. Therefore, we hypothesize that Notch4 signaling in TAMs regulates breast cancer tumor growth. In preliminary experiments, I have stained E7011-treated and control mammary tumors for vascular markers, which showed few differences and further suggested that endothelial cells aren't central to E7011 function. I will, therefore, examine the effect of Notch4 inhibition on macrophage recruitment to primary mammary tumors. I will section cryopreserved primary tumors from two syngeneic murine mammary carcinoma models, Py8119 and E0771.LMB, implanted orthotopically into wildtype C57BL6/J mice. I will perform immunofluorescent staining to quantify macrophages (CD68+) and Notch4 in tumor-bearing mice treated with E7011 or control IgG. In preliminary experiments, I have optimized Notch4 and CD68 double staining. I will use this technique to examine mammary tumors excised at different time points to determine how macrophage recruitment changes with tumor progression. These results indicate that Notch4 inhibition could enable targeting of the Notch signaling pathway in tumor stroma without disrupting normal organ function, making it a valuable therapeutic target in the treatment of breast cancer.

89. Maintaining Difference: Boundary-Making and Ethnic Identification Among Polish Americans in Chicago

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This research explores how Polish Americans in Chicago negotiate their ethnic identity through boundary-making, complicating prevailing narratives of seamless assimilation among white ethnics. Building on the existing scholarship of Mary Erdmans' *Ethnic Options* [1] which emphasizes assimilation and symbolic ethnicity, this study shifts focus to the active production of ethnic boundaries. Using a boundary-making framework [2], I investigate how Polish Americans construct symbolic distinctions both within their ethnic community and in relation to other racial and ethnic groups in the city. Drawing from 10 months of participant observation and 22 in-depth interviews with Polish residents in Chicago, my findings reveal that Polish Americans do not simply identify as "white" or "American." Instead, they maintain a distinct ethnic identity through intra-ethnic boundary work (e.g., differentiating between the progressive and conservative Poles) and inter-ethnic boundary work (e.g., distancing themselves from Mexican and African-Americans). These practices of boundary-making serve as a mechanism for constructing Polish identity while negotiating racial belonging. This challenges assimilationist frameworks by showing that ethnic identification is not a linear process toward whiteness but an ongoing negotiation shaped by urban dynamics and perceived cultural difference. This study contributes to the literature on race, ethnicity, and urban sociology by demonstrating how white immigrant groups in U.S. cities actively construct and protect ethnic boundaries long after initial waves of migration. In doing so, it highlights the limits of assimilation for white ethnics and underscores the role of boundary work in shaping urban social landscapes.

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90. Elucidating the Role of RAB11A in Flow-Induced Endothelial Cell Polarity

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Endothelial cells are a unique cell type that is under constant exposure to biophysical forces exerted by the cardiovascular system. In unbranched regions of the aorta, the largest blood vessel in the body, endothelial cells align their cell body and polarize with laminar shear stress (LSS). Proper mechanosensing of LSS is critical for vascular homeostasis and repair, yet the underlying intracellular mechanisms that mediate flow-induced polarity in endothelial cells are not well-defined. There is a growing body of evidence to suggest that the polarized distribution of mechanosensing receptors (e.g: NOTCH1, HEG1) at the plasma membrane may help confer early flow-induced polarity in endothelial cells while, positioning of critical organelles such as the Golgi Apparatus, occur at a slower time scale. Furthermore, while endosomal trafficking, a system responsible for the sorting and recycling of cellular components, has been implicated in regulating polarity across various cell types, its role in endothelial flow-induced polarity is yet to be fully explored. This research investigates the role of RAB11A, a GTPase involved in endosomal recycling, in facilitating early, flow-induced polarity in endothelial cells. To do so, we utilized human aortic endothelial cells (HAECs) subjected to static and laminar flow conditions (20 dynes/cm²) across multiple time points (30 min, 8h, 24h, 48h) and validated the subcellular localization of RAB11A by immunofluorescence combined with confocal microscopy. Protein expression levels of RAB11A were also assessed via immunoblotting of ECs under static and flow conditions. Our findings reveal that RAB11A exhibits asymmetric (polarized), subcellular localization in ECs and polarizes remarkably in the direction of flow, in as early as 30 minutes. Interestingly, the protein levels of RAB11A do not change under static or flow conditions and remain constant across time. These findings highlight RAB11A as responsive to laminar shear stress, offering insights into its potential role in cardiovascular function and disease. This work is significant as it expands our understanding of endosomal trafficking in endothelial mechanosensing and lays the groundwork for future studies on RAB11A's role in vascular health and pathology.

91. Don't Forget It! Conditional Sparse Autoencoder Clamping Works for Unlearning

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Recent developments in Large Language Model (LLM) capabilities have brought great potential but also posed new risks. For example, LLMs with knowledge of bioweapons, advanced chemistry, or cyberattacks could cause violence if placed in the wrong hands or during malfunctions. Because of their nature as near-black boxes, intuitive interpretation of LLM internals remains an open research question, preventing developers from easily controlling model behavior and capabilities. The use of Sparse Autoencoders (SAEs) has recently emerged as a potential method of unraveling representations of concepts in LLMs internals, and has allowed developers to steer model outputs by directly modifying the hidden activations. In this paper, we use SAEs to identify unwanted concepts from the Weapons of Mass Destruction Proxy (WMDP) dataset within gemma-2-2b internals and use feature steering to reduce the model's ability to answer harmful questions while retaining its performance on harmless queries. Our results bring back optimism to the viability of SAE-based explicit knowledge unlearning techniques.

92. Photoswitching viscoelasticity of PDMS with Donor-Acceptor Stenhouse Adducts

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Covalent adaptable networks are a type of polymer network containing reversibly exchanging bonds. These materials show viscoelastic behavior dictated by the reactivity of dynamic bonds. Therefore, we can control their mechanical properties using stimuli-responsive moieties. Light would be an ideal stimulus for controlling polymer networks, as it provides excellent non-invasive spatiotemporal control. We hypothesized that Donor-Acceptor Stenhouse Adducts (DASAs), a photoswitch that undergoes reversible isomerization between a conjugated open form and a polar, colorless closed form, could act as a dynamic bond in the open form. Therefore, the material would be expected to undergo faster exchange and greater viscoelasticity in the dark and become more elastic upon irradiation. To investigate this proposal, the kinetics of a small-molecule model system was studied. We found that the DASA open isomer reversibly dissociates to its donor amine and acceptor. Furthermore, by conducting exchange reactions in different temperatures and light, we showed that isomerization of DASA can stop the exchange reaction. However, these exchange reactions were slow, and excessive heating led to side products. Studies have shown that hydrogen bonding sources would catalyze the formation of DASA.[1] Therefore, we added different hydrogen-bonding additives to observe changes in the dynamic exchange and viscoelastic behavior of the material. We found that alcohol additives such as 1-octanol and p-cresol catalyze the exchange reaction and accelerate the stress relaxation of DASA-crosslinked PDMS. Further research on different generations of DASAs would further understanding of this exchange system. Light responsive dynamic materials could be applied in soft actuators. By tuning the exchange reaction using DASA isomerization, the material would memorize the shape and change by its functionality based on the light responsiveness.[2,3]

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93. Characterization of Injury Induced Reactive Oxygen Species Using a Human Spinal Cord Organoid Model

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Spinal cord injury (SCI) results in devastating consequences for afflicted individuals, including reduced motor abilities, loss of independence, and increased lifelong mortality rates. Yet, treatment remains limited [1]. Soon after initial injury, an overexpression of long-lasting reactive oxygen species (ROS) occurs, resulting in irreversible secondary injury due to rapid oxidation of vital biomolecules [2]. Given the importance of ROS in acute SCI, a possible treatment that could be applied shortly after injury may provide long term protection. The Stupp Laboratory investigates strategies for regenerative medicine using novel biomaterials and biological platforms of human tissue mimetics compensatory to traditional *in vitro* culture and preclinical animal models. This project focuses on the dynamics of injury-dependent ROS in a human spinal cord organoid model, and how spatial and temporal dynamics change following treatment with materials developed in our laboratory. We hypothesized that ROS expression would increase immediately following injury and then begin decreasing 2 weeks post-injury, and that the curve of this expression could be reduced by treatment with a novel polymer. The localization and intensity of ROS was measured using the fluorescent probe CellROX Green in imaging experiments. We found that ROS expression immediately began locally in the injury site, and then gradually spread throughout the entire organoid over 4 weeks. This pattern was correlated with cell death shown by live-dead analysis. Despite following the same localization pattern in the primary injury site, the abundance of dispersed ROS was greatly reduced by treatment with a polymer. Western blot experiments performed on the ROS downstream factor Nrf2 revealed that the polymer-treated group had Nrf2 levels closer to uninjured levels. In summary, use of the novel organoid model revealed injury dependent ROS dynamics and the model suggests that our polymer offers a potential therapeutic approach for neurodegeneration in SCI.

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94. The Perceptions and Experiences of Attraction in College Students

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Research on attraction has long emphasized the importance of similarity in the formation of interpersonal relationships. Script theorists and sociologists alike illustrate that people often evaluate others based on hegemonic and contextual scripts of behavior and identity. Attraction research has primarily focused on explaining underlying unconscious processes that constitute and create feelings of attraction, with less research on our conscious experience and cognitions regarding attraction. Additionally, much existing research on attraction and non-normative identities focuses on the experience of marginalization in relationship formation and maintenance, limiting existing information on how those with non-normative sexual identities experience attraction itself. This study offers a qualitative analysis of gay and straight individuals' perceptions and experiences of attraction to others, broadly defined. Data were collected through 16 semi-structured interviews with cisgender subgroups: lesbian women, straight men and women, and gay men. Preliminary findings suggest that non-normative identities, including lesbian women and gay men, and some straight women, define and conceptualize attraction in fundamentally different ways than do straight men and some straight women. The data indicate that having a non-normative or non-hegemonic identity can catalyze script generativity, in which individuals create their own language and cognitions regarding attraction. Simultaneously, some hegemonic scripts can be maintained. Furthermore, findings suggest that straight men differ from most other identity groups in their evaluations of potential relationships and the values they use to determine pursuing relational partners

95. Effects of Protein-Specific Diets on Body Composition and Microbial Interactions in a Murine Model

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Protein is an essential part of our diet that supports human health and plays a critical role in the survival of microbes. It influences metabolic processes and ecological interactions. In humans, proteins support muscle growth, enzymatic functions, immune defense, and cellular processes. In microbial communities, proteins drive enzymatic activity, metabolic pathways, and nutrient cycling, shaping the interactions between hosts and microbes. Different dietary patterns can influence the composition of the gut microbiome, which in turn affects nutrient absorption and metabolism. To understand how various protein sources shape host-microbe interactions and metabolic health, a short-term isonitrogenous dietary intervention was conducted using a murine model. Over four weeks, mice were transitioned from a carbohydrate-based diet to one of four protein diets: a standard protein diet (SPD), a 10% aromatic amino acid enrichment (ARD), a 10% branched-chain amino acid enrichment (BCAR), or a mixed enrichment comprising 5% aromatic and 5% branched-chain amino acids (BCD). Body composition was measured weekly using nuclear magnetic resonance (NMR), while daily fecal samples were collected for gut microbiome analysis. Blood samples were drawn at the beginning and end of the study. Our findings indicate that the BCD exhibited the lowest overall body weight but had the highest body fat percentage. In contrast, the ARD group showed the highest weight gain but the lowest fat percentage. These results suggest that protein composition in a diet can differentially influence body composition. This effect may be due to variations in protein breakdown and fermentation by gut bacteria, which ultimately impacts metabolic health. Further research is needed to clarify the underlying mechanisms connecting protein metabolism, the gut microbiome, and body composition.

96. Constructing Martyrdom in the Pro-Palestinian and Black Lives Matter Protests: Narrative Development, Messaging Strategies, and Collective Mobilization

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This paper investigates how constructs of martyrdom have been adapted, framed, and employed in contemporary U.S. protest movements, particularly within Black Lives Matter and pro-Palestinian activism. Figures like George Floyd and Hind Rajab emerge as emblematic icons of their respective movements, and this research will focus on analyzing their roles within this context. Floyd's death became a symbol of the systemic violence faced by Black Americans, encapsulating the struggle for racial justice, while Rajab, a 6-year-old victim of the war on Gaza, represents the broader fight for Palestinian rights and self-determination. This paper utilizes a social media content analysis approach, where I collect posts from Instagram and TikTok that depict George Floyd and Hind Rajab in any capacity. The data collection period for George Floyd spans from his death to the fourth anniversary of his passing, while Hind Rajab's data collection extends from her death to the first anniversary of her passing. I hypothesize that the construction of martyrdom in these movements evolves through digital media, with political events playing a significant role in shaping its narrative and mobilizing support. I aim to develop a theory that explores the process of martyrdom, examining its inception, evolution over time, and how it is influenced by political events. I anticipate identifying patterns in martyrdom representations, particularly in relation to political events. Preliminary findings show that both photos and captions emphasize themes of resistance and martyrdom, while also highlighting innocence, vulnerability, and the humanization of Hind Rajab. The invocation of Hind Rajab tends to occur during critical political events, with her name being used as a symbol of the broader Palestinian struggle. This research expands on existing studies by examining how martyrdom narratives in U.S. protests, specifically the BLM and pro-Palestinian movements, reshape public discourse.

97. Mental Health & Food Insecurity: A Needs Assessment Data amongst University Students

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Following the global pandemic, mental health has been a significant concern, especially among university students, and data from the National College Health Association (ACHA) shows an increasing trend of students seeking mental health services from 2020 to 2024 (27.7% to 35.1%, respectively). ACHA's data also revealed a drastic increase in students who were food insecure from 33% to 45% between 2020 and 2024. To better support students' mental health and understand their needs, we conducted a needs assessment to find out the prevalence of mental health and food insecurity on campus at a diverse private University in Chicago. In Fall 2023, 337 university students agreed to start the online survey, and 172 participants (Women = 70.9%, Men = 17.4%, Trans/Gender Nonconforming = 11.0%; M = 19.8 years old) completed the entire survey. Our participants were racially diverse (White 43.6%, Asian 15.7%, Hispanic/Latino 14.5%, African American/Black 7.0%, and Other 18.6%). Overall, 17% of the participants experienced severe distress, and 46% had high levels of loneliness. Although 17% of the participants had a history of eating disorders (EDs), 12% were currently in treatment for EDs. Regarding counseling status, 38% of the participants received counseling within 12 months. Lastly, 41% of the students faced food insecurity at the time of the data collection, and the first-year students had the lowest prevalence of food insecurity. Even though the history and current EDs status in our study were higher than the ACHA data, other mental health status and food insecurity were about the same as the ACHA data. Through open-ended questions, participants shared a range of requests for mental health resources, including nutrition education initiatives and awareness events focused on EDs on campus. Our presentation will also show how food insecurity and mental health status were associated among our participants.

98. Reducing Racial and Ethnic Disparities in Medicare Annual Wellness Visit Uptake

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The Annual Wellness Visit (AWV) is a Medicare visit that is associated with improved preventive services uptake and patient-reported outcomes. AWVs may reduce mortality, however we investigate the remaining ethnic disparities by developing an understanding of Black and Latino/Hispanic patients' feedback and opinions concerning the completion of AWV. Two focus groups of Black and Latino/Hispanic participants were recruited in June 2024 who were age 65 years and older and had a recent Northwestern Medicine primary care visit. This involved twenty-five participants (88% Black; 12% Latino/Hispanic; 68% female; mean age of 72). Participants began with a brief questionnaire that assessed their preventative care wants and needs and were followed by a guided focus group, questioning health team contact preferences, barriers to scheduling and attending health care visits, as well as knowledge, motivation, or confusion surrounding an AWV. Groups were audio recorded, transcribed, and data were coded. It was found that although participants revert to their PCP for guidance, there is an appreciation for the prompt, organized records-keeping of the patient portal (MyChart). Pertaining to the AWVs, participants' value their relationship with their Primary Care Providers (PCP), so they feel encouraged to improve their comprehension of AWVs, but their hesitancy lies with the unclear motives and content of these visits and fear from historical racial inequalities within medicine. These data will inform the interventions developed to reduce racial and ethnic disparities in uptake of Medicare Annual Wellness Visits. Through insights on the perceptions of underserved Black and Hispanic/Latino participants, informed approaches and messaging can be applied to develop and then pilot-test.

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99. Developing an Electron Paramagnetic Resonance (EPR) Based Assay to Study Structure-specific Positron Emission Tomography (PET) Ligand Binding to Tau Fibrils In Vitro

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Tau proteins are intrinsically disordered proteins which bind and stabilize microtubules in neurons. Misfolded and aggregated tau form uniquely structured amyloid fibrils which characterize a variety of neurodegenerative diseases known as Tauopathies [1]. Diagnosis and progression assessment of Alzheimer's Disease (AD), a highly studied but poorly understood Tauopathy, remain longstanding challenges. While the development of Amyloid Positron Emission Tomography (PET) imaging enables visualization of abnormal amyloid plaques commonly associated with Alzheimer's, there is still not a single test to diagnose AD beyond autopsy. This project investigates structure-specific PET ligand binding by using spin labeled PET ligands, such as OXD2419, which have been computationally designed to bind to AD fibrils. We hypothesized that Continuous Wave Electron Paramagnetic Resonance (CW-EPR) would reveal OXD2419's preferential binding to AD fibrils over other Tauopathies, such as progressive supranuclear palsy (PSP), through detecting changes in spin label mobility. Additionally, a beta cyclodextrin, Captisol®, was hypothesized to prevent PET ligand self-aggregation prior to binding, allowing critical investigation into whether PET ligand stacking observed in previous studies is a characteristic feature of binding or an artifact of in vitro ligand concentrations exceeding physiological levels [2]. An OXD2419 and Captisol® 1:1 complex was mixed with a concentration gradient of AD and cell-derived PSP fibrils and analyzed through CW-EPR. It was found that CW-EPR can robustly report on ligand binding through peak analysis. Additionally, Captisol® effectively prevented ligand self-aggregation prior to binding, yielding data more representative of in vivo conditions. Furthermore, in the presence of Captisol®, OXD2419 appeared to bind to AD fibrils in a concentration-dependent manner and preferentially over PSP fibrils. A deeper understanding of PET ligand binding conformations to AD fibrils may enhance binding specificity and efficiency, increasing the clinical utility of PET imaging for Alzheimer's visualization and diagnosis.

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100. Shifting Gears: Mobility, Safety, and Contested Authority in Urban Space

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This study examines how vehicles, mobility, and urban infrastructures shape perceptions of safety, legitimacy, and social control in marginalized communities. Drawing from ethnographic fieldwork and interviews in South Los Angeles, Inglewood, and Compton, I analyze how residents, law enforcement, and informal actors (e.g., gang members, unhoused individuals, and pimps) navigate the contested power of police cars, trailers, surveillance technologies, and territorial markers. While significant existing research has explored how policing and gang activity structure urban space [1], my study extends this discussion by examining how both mobility and immobility generate instability, from parked trailers evoking fear due to their unknown occupants to police vehicles serving as temporary deterrents rather than sustained enforcers of order. Synthesizing assemblage theory [2] and open Marxist critiques of symbolic enforcement [3], I argue that vehicles and urban infrastructures do not merely reflect control but actively produce and unsettle social order. Cars provide protection and autonomy for some while heightening unpredictability and surveillance for others. Policing strategies rely on the visual presence of deterrence (e.g., police cruisers, cameras) rather than long-term stability, revealing gaps between symbolic enforcement and substantive governance. At the same time, informal actors repurpose urban infrastructures using vehicles to signal authority, recording fights for social capital, or resisting surveillance through norms of non-cooperation. While assemblage theory emphasizes the fluid and contingent nature of power, open Marxism highlights structural antagonisms that shape these processes. My research engages with both perspectives, showing how vehicles, mobility, and urban infrastructures simultaneously reinforce state legitimacy and create opportunities for subversion and informal governance. These findings contribute to scholarship on urban policing, informal governance, and spatialized power, demonstrating that mobility and urban infrastructures are not fixed instruments of control but arenas of constant negotiation where authority is tested, reinforced, and contested in everyday life.

101. Temporal Analysis of Notch 4 and Notch Pathway Signaling in Tumor Associated Macrophages (TAMs) in the Breast Tumor Microenvironment

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Current antiangiogenic therapies have failed to produce enduring reduction in tumor progression in breast cancer, but other angiogenic pathways, such as the Notch developmental pathway, have not been fully explored. The Notch pathway includes four Notch receptors (Notch1-4). Our group has demonstrated significant reduction in growth of breast tumors in response to treatment with a novel neutralizing antibody against Notch4, E7011. Our research indicated that orthotopic murine mammary tumors treated with anti-Notch4 E7011 or control human IgG showed a significant expansion of tumor associated macrophage (TAM) populations when assessed by single-cell RNA sequencing. E7011 treatment showed no effect when TAMs were depleted via liposomal clodronate, suggesting macrophages are essential for the efficacy of Notch4 blockade by E7011. Previous studies demonstrated that Notch1, but not Notch4, is elevated in M1 like macrophages, which have pro-inflammatory anti-tumor characteristics, and is decreased in M2 like macrophages which have anti-inflammatory, pro-tumor characteristics. Our preliminary results suggest that Notch4 may play an opposing role and is elevated in M2 like macrophages. We hypothesize that in the breast tumor microenvironment, Notch4 activity in TAMs inhibits the other Notch receptors, resulting in M2 type differentiation. I will quantify longitudinal changes in macrophage populations in tumors treated with E7011 or IgG and will assess Notch4 expression in macrophages relative to canonical Notch signal in a genetic mouse Notch pathway reporter, the CBF-Venus mouse. To do this, I will section and perform immunofluorescent staining of murine breast tumors from two different cell lines, Py8119 and E0771.LMB, harvested at multiple time points. In my preliminary experiments, I optimized the immunofluorescent staining protocol to identify the most effective Notch4 aliquot and minimize background signal, enhancing the focus on target cells in images. These experiments will define the role of Notch4 and the mechanism of action of a potential therapeutic agent, E7011.

102. Predicting whole-brain neural dynamics from prefrontal cortex fNIRS signal during movie-watching

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Neuroimaging techniques such as functional magnetic resonance imaging (fMRI) and functional near-infrared spectroscopy (fNIRS) have significantly advanced our understanding of brain function. While fMRI provides high spatial resolution, its cost and logistical constraints limit large-scale and naturalistic research. In contrast, fNIRS offers a portable and cost-effective alternative but is restricted to measuring cortical surface activity. This study bridges these limitations by developing a predictive model that learns statistical relationships between fNIRS and fMRI signals to estimate whole-brain fMRI dynamics from fNIRS data. We trained a principal component regression (PCR) model using an independent fNIRS-fMRI dataset (*Sherlock*), then tested the model within the same dataset and on an entirely different fNIRS dataset (*Friday Night Lights*). This allowed us to evaluate model performance both within and across datasets to assess its generalizability. Model accuracy was assessed using correlation analyses, functional network assessments, and inter-subject functional connectivity (ISFC), a measure of synchronized brain activity across individuals. Within-dataset results demonstrated significant correlations between predicted and actual fMRI signals across 92 of 122 brain regions. Across-dataset results confirmed that the model successfully generalized, with significant predictions in 66 of 122 regions, particularly in the default mode and control networks. Predicted fMRI time courses also reproduced whole-brain ISFC patterns, suggesting that fNIRS-based models can infer large-scale neural dynamics with meaningful functional connectivity. These findings demonstrate the feasibility of using fNIRS as a scalable and cost-effective functional alternative to fMRI through predictive modeling. By enhancing accessibility and ecological validity in neuroimaging research, this approach has the potential to expand investigations into brain function in diverse and real-world settings.

103. The Impact of Sports Participation on Gender Expression and Self-Perceptions of Female Athletes

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Women's sports in the United States are growing exponentially, with record amounts of viewership, attendance, revenue, and investment at all levels of competition. However, sports are traditionally a male domain, and women in sports have historically been met with exclusion, prejudice, and discrimination. Western society associates sports and athleticism with traditionally masculine traits, such as strength and toughness, while it places increased value on women who align with traditionally feminine characteristics, such as weakness and docility. Female athletes therefore inherently diverge from both athlete and gender norms, which may influence how they experience themselves in sport and navigate their femininity and roles as women in society. This study explores how participating in women's sports affects the identities of female athletes and impacts their understanding and personal expression of gender, with data collected from qualitative interviews with 16 female student-athletes on Northwestern University varsity women's sports teams. Preliminary findings suggest that female athletes may find it difficult to balance being a woman, being feminine, and being an athlete, with these various identities intertwined. Female athletes hold personal schemas of femininity that are distinct from their understandings of a traditional societal framework, often finding ways to express their personal definition of femininity while playing their sport. While not without challenges, these female athletes discussed learning to accept and appreciate themselves, their bodies and athleticism, and their roles in society.

104. How Can We Leverage Community Health Worker (CHW) Notes to Supplement Tabular Features and Improve the Classification of Emergency Department (ED) Readmissions?

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As the capabilities of machine learning have developed, researchers and healthcare providers are exploring its application to health informatics to improve outcomes and address health equity. The Centers for Medicare and Medicaid Services considers 30-day readmission rates to the Emergency Department (ED) an important measure of care quality, reflecting how well hospitals prevent complications and ensure smooth care transitions. Simultaneously, certain readmissions are necessary, the goal is to reduce avoidable unplanned revisits. The Sinai Urban Health Institute (SUHI), which has a long history of health equity research, trains Community Health Workers (CHWs) to follow up with patients post-discharge, offering resources that help prevent 30-day ED readmissions. The CHWs come from the same Chicago neighborhoods as the patients and serve as a trusted liaisons between the hospital and the patients. Past research has demonstrated the value of integrating CHW and Social Determinants of Health (SDoH) data in predictive models of 30-day ED readmissions. However, text notes recorded by CHWs have been underutilized. Incorporating these notes is challenging due to their sparsity, varied structure, and the absence of labeled content. Our project aims to leverage a subset of "resource notes," which clearly document specific resource needs (e.g., food or transportation), to enrich the broader set of CHW notes with meaningful tags that could help further enhance 30-day ED readmission prediction. So far, we have generated some frequency analysis and visualization to help the team understand the differences between contact and resources notes with a particular focus on food and transportation resource notes which are more represented in our dataset. Preliminary findings suggest that patients with certain resource notes may experience different readmission rates. We also examined the total readmission rate for each resource type and applied Yule's Q to assess whether patients receiving resources differ from those who do not.

105. Oh Hair No!: The Effect of Hair Texture on Complimenting Behavior in Video-mediated Chatrooms

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To date, research has shown that judgments made about racialized features frequently lead to differential treatment for same-race individuals. For example, darker individuals are more likely to receive harsher criminal sentences than their lighter counterparts. While such studies have highlighted the significance of skin tone differences at the intragroup level, comparatively less research has focused on other racialized features, including hair texture. Across five studies, we explore the extent to which a conversational generosity bias toward straight hair would manifest video-chat partners' complimenting behavior toward black female targets. We suggest that the visual element of synchronous communication may provide both the opportunity and context for this form of perceptual bias to unfold as a type of decision-making process. Using a coding system developed specifically for this study, we measured both the frequency and quality of compliments video-chat partners issued as a function of *seeing* our black female targets through the lens of hair texture (Straight/Natural) immediately following the onset of the spontaneous visual encounter. Preliminary results show qualitative differences in complimenting behavior as a function of hair texture, including the use of global vs. specific references to the target's physical appearance (e.g., *"you look beautiful" vs "juicy lips"*) in the straight hair condition when compared with the natural hair condition. Results also show preliminary differences in the rate of complimenting behavior between hair texture conditions (Studies 1 & 2). Initial findings provide a basis for more nuanced examinations of the consequences of interpersonal perception in on-line interactions with Black women at the intersection of technology and the human experience.

106. Enhancing Migration and Accumulation of CAR T Cell into Solid Tumors through FMNL1 Overexpression

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Cancer is one of the leading causes of death in the United States with approximately 600,000 fatal cases per year. Recent therapies have aimed to treat solid tumors through the adoptive transfer of tumor infiltrating lymphocytes (TILs) or chimeric antigen receptor (CAR) T cells along with checkpoint inhibitor treatments. Yet, the tumor microenvironment of abnormal vasculature and collagen-rich extracellular matrix structures inhibits the migration and infiltration of T cells into the tumor mass. To enter solid tumors, T cells must be able to extravasate through the complex vasculature and migrate within restrictive microenvironments. Given the emerging concern of immune cell migration to tumor sites, we analyzed a cytoskeletal effector protein identified as Formin-like-1 (FMNL1). Analysis of FMNL1 KO-deficient T cells transferred into RIP-mOva mice (model of type 1 diabetes) shows a reduction of immune recruitment in islets, the tissue of interest. Preliminary data of FMNL1 overexpressing tumor-specific T cells enhances immune cell accumulation at the tumor site of implanted Melanoma tumor models (B78). Additional analysis shows that when using CAR T cells against solid tumors, FMNL1 overexpression significantly increases the number of CAR T cells within the tumor compared to other peripheral tissues. In vivo lung carcinoma studies of FMNL1 overexpression enhance CD8 CAR T cell accumulation at solid tumor sites. Moreover, we have identified that FMNL1 CAR T cells has increased longevity against control CAR T cells in tumor populations across time intervals. Through these main focuses, our data supports the hypothesis that FMNL1 overexpression in CAR T cells and other TILs is a promising method to enhance T cell migration and accumulation into solid tumors. Future studies will be focused on analyzing the ability of formin family member mDia in enhancing migration towards solid tumors and exploring its interaction with FMNL1.

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107. Synthesis and Evaluation of New Protein Aggregation Inhibitors for the Treatment of ALS

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Amyotrophic lateral sclerosis (ALS) poses a significant challenge due to its complexity and limited treatment options. Protein aggregation has been linked to the onset of ALS by inducing cellular stress and disrupting homeostasis. Often patients exhibit a loss in upper and lower motor neurons leading to progressive weakness in muscles and death by respiratory failure [1]. Hence, following this observation, the Silverman Group at Northwestern University has made strides in ALS treatment by the identification of cyclohexane 1,3-diones as potential chemicals for treatment. NU-9 has demonstrated promising outcomes by enhancing cellular integrity, reducing protein aggregation levels, and improving motor behavior in preclinical studies. The development of NU-9 (now AKV9) showed promise in preclinical studies providing increased benefits compared to riluzole [2]. However, further enhancements are necessary to maximize its therapeutic potential. This project focuses on targeted modifications to the structure of NU-9 to improve its efficacy by identifying components that best improve anti-aggregation capacity. The approach involved retaining critical structural elements of NU-9 while focusing on modifying the chiral oxygen linker. Structures with varying levels of sterically hindering linkers were synthesized, forcing the molecule to adopt stabilized conformations. Initial compounds were tested in cellular models (PC12 cells) with ALS-associated gene mutations, such as SOD-1^{G85R}, to evaluate their impact on cellular survival and protein aggregation inhibition. Thus far, it has been observed that the introduction of bulkier, sterically hindered linkers lowers the ability of the molecule to decrease protein aggregation and increase cellular survival. It is necessary to determine the molecules' ability to cross the blood-brain barrier and be delivered to the central nervous system (CNS) [3]. Additional molecules that provide potent capacity in the cellular models but have low permeability capability are currently being modified in an attempt to increase permeability while retaining function.

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108. Optimizing an In-vitro Model of Atherosclerosis

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Atherosclerosis is the leading cause of heart disease, which is the cause of one in five deaths in America. It has been revealed that atherosclerosis has the hallmarks of a chronic inflammatory disease. However, the development of treatments targeting this inflammation is hindered by a limited selection of anti-inflammatory drugs and the necessity for preliminary in vitro testing of new therapeutic agents. Critical to these tests are foamy macrophages, which are macrophages engorged with low-density lipoprotein (LDL), a key factor in atherosclerosis. The current methodologies for generating these cells involve treating macrophage-like cells with oxidized LDL (oxLDL). Yet, this approach suffers from significant variability in oxLDL concentrations and incubation times, leading to inconsistent and often unreliable results both in published studies and our laboratory experiments. We hypothesize that using a primary cell line, like bone marrow derived macrophages (BMDMs) instead of an immortalized one, like Raw 264.7 cells, will be more consistent in producing foamy macrophages. Thus, our project has developed an optimized method for producing foamy macrophages using oxLDL and BMDMs. This model was developed by incubating BMDMs in various types of LDL and then imaging these cells using Oil Red O as a stain for lipid-laden foam cells. With this model established, we can do in vitro studies using potential anti-inflammatory therapeutics. One of these therapeutics is 2D03-IL-10, an LDL binding protein that delivers the anti-inflammatory cytokine, IL-10 to foamy macrophages that was developed by Dr. Lisa Volpatti. By establishing this model, we hope to enhance the reliability of future evaluations of anti-atherosclerosis therapeutics, thereby accelerating the translation of promising compounds into clinical trials.

109. Defining the Effects of Low-Dose Acute Chemotherapy on the Ovarian Microenvironment in Pre-Pubertal and Adolescent Patients

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Pediatric cancer survival rates are >85% following advancements in anticancer therapeutics. However, treatments, particularly alkylating chemotherapy, can cause infertility and hormonal dysregulation. Currently, ovarian tissue cryopreservation (OTC) is the only fertility preservation option for pre-pubertal females, wherein tissue containing primordial follicles (PMFs), or premature eggs, is cryopreserved. Patients can later retransplant tissue via ovarian tissue transplantation (OTT), restoring fertility and endocrine function. While some OTT patients have children, hormone functionality lasts only ~2-5 years due to not-yet understood post-transplantation PMF depletion. We hypothesize that prior exposure to low levels of alkylating chemotherapy may impact how ovarian vasculature affects post-transplantation PMF development and subsequent depletion. We investigated the impact of exposure to alkylating agents on follicle characteristics and vasculature using ovarian biopsies from 32 Lurie Children's Hospital OTC patients. Using H&E staining, we found more abnormal vessels in pre- and post-pubertal patients exposed to alkylating chemotherapy. Immunohistochemistry analysis was conducted using an endothelial glycan-specific dye, anti-CD34, and anti-alpha-smooth muscle actin to assess differences in vessel maturity. There were significantly more CD34+ (immature) vessels in exposed vs. unexposed patients. In exposed vs. unexposed, there were significantly more CD34+ vessels in the pre-pubertal cohort but not the post-pubertal. We also assessed follicle characteristics and granulosa cell (GC) (hormone-producing cells that support follicles) counts to investigate potential differences in quiescence, as well as follicle DNA damage using immunohistochemistry. Transitional follicles (TFs) in exposed pre-pubertal patients were smaller, and PMFs and TFs contained fewer GCs per follicle vs. non-exposed. Exposed post-pubertal patients also showed a reduction in the number of GCs per PMF and TF and increased DNA damage. This data suggests patients are differentially affected across pubertal status and exposure. Impending immunohistochemistry assessment of activation and apoptosis will strengthen findings that may suggest alterations to current transplantation methods given these differential impacts.

110. Airbnb and Bronzeville's Economic Opportunity: A Chance of Empowerment or A Fuel to Racial Inequality?

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This research studies the impacts of Airbnb on racial relations and economic opportunity in Chicago's historic Black Bronzeville neighborhood. It addresses whether Airbnb offers equal economic opportunity for Black hosts as it does for non-Black hosts in Chicago, whether it is accelerating gentrification and displacement, and how it intersects with broader patterns of racial inequality. Based on the theoretical frameworks of William Julius Wilson (jobless ghetto) and Patrick Sharkey (cumulative disadvantage) and a "Disruptionists" vs. "Reproductionists" explanation of the sharing economy, this study examines if Airbnb reverses historical disinvestment or exacerbates existing inequalities. The method is a qualitative and quantitative comparison of 146 Bronzeville Airbnb listings according to publicly available information and coding of host demographics and listing descriptions. Preliminary results show that while most listings are operated by Black hosts, there is broad disparity, with some hosts appearing to be local residents attempting to gain supplemental income and others operating several properties as investors. Moreover, most listings appeal to Bronzeville's cultural legacy, indicating a cultural branding strategy. However, these listings have lower prices and booking rates compared to similar listings in white-majority areas. Occupational data shows that many hosts hold professional occupations, suggesting that their engagement with Airbnb is secondary. This research seeks to contribute to understanding how short-term rentals shape racialized economic opportunities in historically marginalized neighborhoods, informing policy and assisting efforts to advance economic equity in communities of color.

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111. Investigating the Impact of XPB1S Transgenic Activation in Oligodendrocytes on Multiple Sclerosis Mouse Model

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Multiple Sclerosis (MS) is an autoimmune and neuroinflammatory condition that leads to the demyelination of neurons in the Central Nervous System (CNS), inflammation, the death of oligodendrocytes, and axonal degradation. There is evidence that protecting oligodendrocytes relieves the pathological effects of MS, namely by reducing inflammation, and mitigating demyelination. Inflammation-triggered stress initiates the unfolded protein response (UPR) in both MS, and its mouse model, experimental autoimmune encephalitis (EAE). EAE specifically induces inflammation, demyelination, and an innate immune response in the spinal cord, mimicking the same symptoms observed in MS. There are three pathways associated with the UPR: protein kinase RNA-like endoplasmic reticulum kinase (PERK), activating transcription factor 6 (ATF6), and inositol requiring enzyme 1 (IRE1). Our focus is the IRE1 pathway, which splices XBP1 and directs gene expression that promotes endoplasmic reticulum (ER) proteostasis, relieving ER stress. This pathway is not heavily upregulated in oligodendrocytes naturally. We hypothesized that forcefully inducing the IRE1/Xbp1 using an oligodendrocyte specific conditional knock-in of XBP1s (*ROSA26; Plp-Cre*) transgenic system to overexpress XBP1s could protect oligodendrocytes (OLs), the myelin-producing cells of the central nervous system (CNS). Using EAE in OL-specific knock-in Xbp1s mice, we observed reduced disease progression through analysis of electron microscopy (EM) and immunohistochemistry (IHC) data, as well as through improved clinical scores in EAE mice. We specifically observed an increased number of myelinated axons in *Cre+* mice via EM analysis. Furthermore, we observed a significantly higher number of TPPP+ oligodendrocytes in *Cre+* mice, and a significant reduction in the % lesion areas and quantity of CD3+ T-cells in *Cre+* mice. This indicates that there is reduced inflammatory infiltration paired with the protection of oligodendrocytes in *Cre+* mice. These results demonstrate therapeutic promise by safeguarding OLs, preserving myelin, and mitigating inflammation.

112. Neuroinflammatory and Demyelination Changes in the Townes Model of Sickle Cell Disease

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Sickle cell disease (SCD) is an autosomal recessive monogenetic disorder characterized by anemia and painful vaso-occlusive episodes. Patients with SCD are also at risk for neurological complications, including cognitive and motor dysfunction. Despite the known clinical profile of SCD, the cellular effects on the brain, particularly regarding demyelination, remain poorly understood. We investigate the hypothesis that neuroinflammatory and demyelination changes in the hippocampus and striatum of Townes SCD mice by comparing sickle cell (SS), sickle cell trait (AS), and control (AA) groups. Immunofluorescence staining was performed in paired combinations to assess markers in the hippocampus and striatum, with DAPI counterstaining used to trace nuclei. For the MBP/Iba1 pair, which stains myelin and microglia respectively, SS mice showed increased Iba1 activity while AA mice exhibited robust MBP staining. Similarly, in the GFAP/MBP pair, SS mice displayed elevated GFAP staining, suggesting increased astrocyte reactivity compared to AA mice with stronger MBP signals. In the Iba1/TLR4 pair, SS mice demonstrated both heightened microglial activation and significantly higher TLR4 expression than that seen in AA. The Neurofilament/Iba1 pair revealed increased neurofilament staining in SS mice, likely reflecting axonal pathology due to myelin loss, while AA mice maintained higher MBP signals. Lastly, the MBP/H2B5 pair showed that H2B5, a marker of chromatin modifications under cellular stress, was significantly elevated in SS mice, with AS mice showing a milder increase. In SS mice, we observed an increase in microglial activation, astrocyte reactivity, and cellular stress markers that's associated with significant myelin loss and axonal damage. AA mice maintained intact myelin, with AS mice showing intermediate changes, indicating a graded pattern of neuroinflammatory and demyelinating effects. These findings support the hypothesis that SS mice exhibit increased neuroinflammation and myelin damage compared to AS and AA mice, contributing to neuronal dysfunction in SCD, potentially guiding future therapeutic strategies.

113. Identification of Type 4 Secretion System Substrates in *S. maltophilia*

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Stenotrophomonas maltophilia is an opportunistic multidrug-resistant pathogen that poses a significant threat to immunocompromised patients, particularly those with cystic fibrosis or undergoing invasive hospital procedures. Its Type IV Secretion System (T4SS) facilitates interbacterial competition by delivering effector proteins into competing microbes, representing a unique pathogenic model. Prior studies established that T4SS exhibits antibacterial activity against *Pseudomonas aeruginosa*, *Pseudomonas mendocina*, and *Escherichia coli*. However, the specific molecular interactions underlying substrate recognition remain poorly understood. Using a bacterial adenylate cyclase-based two-hybrid assay, our lab identified five T4SS substrates that interact with VirD4, the coupling protein responsible for recognizing and translocating effectors. However, seven additional putative effectors failed to bind VirD4 in prior experiments. This study aims to systematically reassess these non-binding effectors by re-engineering their genetic fusions to the N-terminus of *VirD4*, as opposed to the C-terminus used in previous assays. This alternative approach accounts for potential steric hindrance that may have masked prior interactions. By elucidating the substrate recognition mechanism of the T4SS, this work advances our understanding of *S. maltophilia* pathogenesis and may inform future strategies to combat its antimicrobial resistance. Through this two additional substrates of the S. maltophilia T4SS were identified that were missed by the prior studies.

114. Developing and Testing a Vapor Compression Cycle System Facility

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The vapor compression cycle is the process in which a fluid (refrigerant) undergoes phase changes due to fluid properties and in-unit mechanisms. The mechanisms are the compressor, condenser, expansion valve, fan, and evaporator. A water source heat pump (WSHP) is an emerging technology that is being implemented more in HVAC systems for its high efficiency and it incorporates the vapor compression cycle to condition air. The WSHP has an open-air loop, a closed-water loop, and a closed-refrigerant loop, and their qualities at various points can be measured under different operating modes.
The co-axial water-to-refrigerant coil exchanges energy from the refrigerant to the water. The compressor pressurizes the refrigerant to a high-pressure, high-temperature superheated gas. The four-way reversing valve allows for both heating and cooling functions. The microchannel air-coil exchanges energy between incoming air with the refrigerant to condition to the appropriate temperature. The thermal expansion valve restricts refrigerant flow, inducing a pressure and temperature drop.
The goal of this study is to measure the discrepancies between the theoretical and experimental system operation of the vapor compression cycle in a WSHP. The phase change of the refrigerant and the heat rejection to the water loop can be analyzed by collecting data on the temperature, pressure, and mass flow rate and then applying thermodynamic principles to solve for efficiencies and heating/cooling capacity. This is achieved by building a prototype around a WSHP with air, water, and refrigerant loops connected and utilizing appropriate gauges to quantify the processes. The temperature setpoints and refrigerant amount can be varied to optimize operation. There remains work to install sensors into the refrigerant line and connect the control board to automate the operation. The collected data from the water loop indicates the expected heat rejection during the cooling mode and the need for several water pumps.

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115. Helium-Filled Soap Bubble Generator Build

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Helium-Filled Soap Bubbles (HFSB's) are neutrally-buoyant bubbles used for flow visualization. They assume the characteristics of the surrounding environment, making them ideal for aerodynamic research. To produce HFSBs rapidly, accurately and with modularity, a 3D printer approach is adopted to create a carefully designed nozzle.The nozzle contains channels that are < 1.0 mm in diameter, making the print process challenging. The purpose of this project is to successfully print a HFSB nozzle using various printing and cleaning techniques, and to characterize the bubble generation. These techniques, which include printing with default settings, printing with varying laser intensities, and cleaning with ethanol, were explored in varying degrees until the HFSB nozzle could be printed without any blockages in the small channels. It was found that these blockages were primarily the result of the high laser intensity of the FormLabs-3 printer, which could not be freely adjusted. Switching to the Anycubic Photon Mono M7 Pro 3D printer allowed for freedom to adjust the printer settings, which eventually led to successful prints. The resulting HFSBs were characterized using high-speed shadowgraph imaging at 67,000 frames per second, with nominal bubble diameters of 200 micrometers.

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116. XPRIZE Rainforest Competition - Semi Automated Biodiversity Assessment

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Tropical rainforests are the most biodiverse ecosystems on Earth, but their density restricts our assessment effort. The XPRIZE Rainforest competition aims to address this problem by developing rapid and autonomous technologies to gain near real-time insights into biodiversity. The competition required teams to survey 100 hectares of tropical rainforest in 24 hours and analyze real-time insights within 48 hours.

The Robotics Lab at IIT has partnered with Purdue University, The Morton Arboretum, and Natural State to form a team, that is one of the six finalists in this competition. We have been developing a drone-based sensor-package delivery system. The approach emphasizes affordability, scalability, and robustness to withstand challenging conditions. We have two data collection techniques: drone-delivered-and-retrieved audio and video sensor packages that perch on top of the tree canopies and eDNA from water and air filter samples. This was complemented by landscape-scale canopy mapping to assess tree diversity. We ensured high data integrity through a QR coding system and metadata survey, linking each sensor element, storage device, and sample to downstream processing and results.

During the 24-hour data collection phase of the XPRIZE Rainforest finals, our team deployed and retrieved 11 sensor packages, with the furthest located over 900 meters from our location. Sample locations were selected based on initial assessments of forest canopy diversity and tree phenological status. Utilizing maps from automated drone flights and the expertise of Indigenous tree scientists, we identified two distinct water sites for eDNA sampling. Our analysis identified 121 species: 72 birds, 25 mammals, 2 reptiles, 14 amphibians, 3 fish, 1 insect, and 6 monocots.

However, it was also determined from field testing that camera traps are not effective for animal identification passively. We are developing algorithms to triangulate animals' sound locations to make active control decisions and make the camera more effective.

117. LLM Powered Role-Playing Games for Boosting Empathic Communication

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What does it mean to empathize with a person? While recent research has revealed that large language models (LLMs) can sometimes express empathy more effectively than humans, people still feel less heard when they know a message was AI-generated. These findings reveal the human need for emotional connection from other humans, presenting an opportunity to leverage LLMs' capacity to help improve people's empathic communication rather than trying to replace it. Motivated by this potential, we investigate: How does people's empathy expression change when receiving different forms of feedback? What is a justified framework for evaluating empathic expressions? What reactions do people have when receiving AI-generated feedback on their empathic communication? After conducting a literature review and collaborating with an expert in communication studies, we came to the conclusion that high quality empathic communication involves validating their emotions, encouraging elaboration via open-ended questions, and demonstrating an understanding of their experiences via paraphrasing. In contrast, instances of unsolicited advice-giving, self-oriented responses, and responses which dismiss emotions tend to lead to less empathic communication. To assess how feedback influences the occurrence of the aforementioned metrics, we developed a role-playing game (RPG) that allows individuals to practice providing empathic support through simulated conversations. Our preliminary findings suggest that engaging in structured role-play and receiving personalized feedback from a LLM can improve people's empathic communication. When provided with the opportunity to ask follow-up questions on their performance, participants tended to ask for general clarification, justify why their responses were better than the AI suggestions, acknowledge the feedback and express gratitude, seek additional comments, or criticize the coaching for being AI-generated. It suggests that although people have some reservations about AI-generated advice on empathic communication, LLM feedback has the potential to help people express empathy more effectively.

118. The Ontogenetic Development of Tooth Size in the Crocodile Shark, *Pseudocarcharias kamoharai* (Lamniformes: Pseudocarchariidae)

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The crocodile shark, *Pseudocarcharias kamoharai* (Matsubara), is an extant lamniform shark. Many aspects of its biology are still poorly understood, including the ontogenetic development of teeth. In this study, we used linear regression analyses to examine the relationship between the total body length (TL) and the tooth crown height (CH) of each tooth in 14 individuals of *P. kamoharai* ranging from 72-109 cm TL collected from the Pacific and Indian Oceans. The resulting regression equations suggest that the increase in CH of teeth through tooth replacement is generally proportional to an increase in TL, with a high coefficient of determination between TL and CH and high predictability of TL from CH (as high as r^2 = 0.8937; p <0.0001) found in teeth located anteriorly (i.e. the so-called "anterior teeth"). This study is significant because it allows TL estimations for the genus *Pseudocarcharias* in the fossil record, which is represented only by teeth. For example, previously published *Pseudocarcharias* teeth from the middle Miocene of Italy, include anterior teeth with a complete or nearly complete crown. If our regression equations for the anterior teeth are applied to those fossil teeth, their TL estimates range from 105-231 cm. These estimates are significant because they are considerably larger than the longest recorded TL for the extant *P. kamoharai* (122 cm), providing new insights into the ancient marine ecosystem.

119. Expanding the Design Space of Cancer Therapeutics with DNA Dendrimers as Novel cGAS-STING Immunotherapies

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Novel immunotherapeutic approaches are desperately needed to treat cancers that foster immunosuppressive tumor microenvironments (TMEs). Activation of the cyclic GMP-AMP synthase (cGAS)-stimulator of interferon genes (STING) pathway to generate pro-inflammatory TMEs is a promising therapeutic approach; However, current therapeutics targeting the STING enzyme have proven disappointing in clinical trials [1]. We postulate that activating the upstream cGAS enzyme is preferred due to stimulation of additional inflammatory pathways and its catalytic activity. cGAS is stimulated by double-stranded DNA (dsDNA) in a length-, concentration-, and orientation-dependent manner, but therapeutic DNA exhibits low cellular uptake and is rapidly degraded by nucleases [2]. To overcome these obstacles, interferon stimulatory DNA (ISD; a DNA sequence known to stimulate cGAS) can be formulated as DNA dendrimers which consist of multivalent DNA clusters radiating from a molecular core. However, the synthesis of dendrimers with DNA of sufficient length to potently activate cGAS (≥45 bp) is low yielding. We hypothesized that addition of surfactant, organic solvent, and salt may increase strain-promoted azide-alkyne cycloaddition (SPAAC) reaction yields of six-branched 25 base-pair interferon stimulatory DNA dendrimers (ISD25-6). These synthetic parameters enabled a 2.93-fold yield increase compared to analogous literature reactions [3]. Resulting ISD25-6 acts as a template to generate longer ISD45-6 dendrimers through template-mediated chemical ligation. We find that increasing both the valency and length of DNA dendrimers improves cGAMP catalysis and the ability of these therapeutics to nucleate cGAS:DNA liquid phase condensates. Additionally, we find that ligated dendrimers outperform their hybridized counterparts in a RAW-Lucia Macrophage IRF3 induction assay. Here we report a synthetic methodology to generate a diversity of DNA dendrimers, and we show that cGAS activation can be potentiated by presenting DNA ligands as multivalent nanotherapeutics.

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120. Visualizing the Effects of Excitatory Stimulation on the Glycosylation of Synaptic Proteins

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The Endoplasmic Reticulum (ER) and Golgi Apparatus (GA) are two organelles in which post-translational modifications of membranous proteins occurs. These modifications are critical in regulating the structure and function of synaptic receptors, ion channels, and adhesion molecules, and thus influence neuronal communication. We have shown that the sialylation of membrane-bound glycoproteins can be carried out by novel organelles known as Golgi Satellites (GSats). Our previous research has shown:

1. GSats are formed following the dispersal of the GA upon neuronal excitation.
2. GSats are mobile in axons and dendrites, especially during excitation. Following excitatory synaptic neurotransmission, GSats are translocated to pre- and post-synaptic sites.

Previous research from other groups has also shown that Golgi enzymes, sialytransferases, are involved in the rapid increase of sialic acid content of glycosylated pre- and post-synaptic proteins. The current experiments aimed to correlate the observed changes in subcellular GSat localization with measurable changes in the sialic acid content of synaptic proteins. We used a well-established embryonic rat cortical culture model to assay *in vitro* if neuronal excitation led to increased sialic acid content at synapses. We utilized fluorescence lectin labeling and confocal microscopy to visualize and measure changes in sialic acid content at postsynaptic sites. Following neuronal excitation, we observed changes in synaptic surface glycans, indicating that GSats may cause local changes in synaptic protein sialic acid content which are required for long-term synaptic plasticity changes.

121. What Does Moderate Mean? Using Operational Ideology and Atypical Voting Behavior to Predict Moderate Ideological Identification

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In recent years, moderate voters have often been described as the key to electoral politics in the United States. While moderates have gained substantial mainstream attention, there remains considerable academic debate as to what moderate ideological identification means and whether self-proclaimed moderates truly embody a distinct political ideology. This study investigated the hypothesis that moderate ideology is driven by a combination of issue area (policy) preferences and measurable psychological biases. I applied logarithmic regression modeling to Cooperative Election Study (CES) data from 151,891 voters across the 2008-2020 U.S. presidential election cycles. My model assessed the influence of voter policy preferences and atypical voting behavior on the likelihood of moderate self-identification. Atypical voting behavior, including split-ticket voting and partisan-inconsistent voting, was used as a proxy for implicit psychological biases exhibited by voters, including attempts to manage cognitive dissonance. I found statistically significant results, indicating that while moderate ideology correlates with issue area preferences, it is significantly shaped by measurable psychological mechanisms resulting in ideological self-identification inconsistent with policy-preference-based measures. This research has strong implications for understanding and appealing to a group of immense strategic importance in American politics. Moderates should not be assumed ignorant, as strong policy bases underlie their identification. However, a purely ideological appeal does not fully address the psychological mechanisms driving moderates. My findings also pose important implications for the broader study of ideology in Political Science, underscoring the need to analyze ideology as an amalgamation of rational and psychological components rather than considering either factor in isolation.

122. When Home Becomes a Hospital Room: The Intersection of Caregiver Expectations, Lived Experience, and Child Interactions During Extended Hospital Stays

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Caregivers' involvement in their children's medical care has greatly increased [1]. This is of particular note for dire conditions, such as pediatric cancer. Moreover, hospital length of stay is positively correlated with the severity of illness and parental psychological distress [2, 3]. Few studies have addressed the in-depth experience of pediatric cancer caregivers whose children endured a hospitalization of greater length. Insight is needed into the perceived efficacy of supports, prior expectations regarding hospitalization, and potential moderators of the experience. This project examines the experience of caregivers whose children (ages 2 to 12 at the time of treatment) have endured a consecutive, three-week or greater hospitalization. Primary caregivers (n=12) completed a survey on demographics, psychological distress, optimism, and parenting beliefs, followed by semi-structured interviews on hospitalization expectations, experiences, and parent-child interactions. Participants will be grouped by median survey scores to compare experiences and identify moderators. Results of the semi-structured interviews indicate that the majority of caregivers have little to no expectations going into a long-term hospitalization; caregivers expressed feelings of shock, overwhelm, and being misinformed. Caregivers preferred clear, specific support over vague offers, favoring direct questions over general statements like, "Let me know if I can help." Caregivers within the sample also often expressed feelings of invalidation by a medical team. Some caregivers' children's medical complications were not addressed until they further pressured medical staff. Finally, caregivers perceived leisure activities of particular assistance to themselves and their children. Many discussed incorporating familiar items or games brought comfort and improved their child's mood. These findings highlight the need to better prepare caregivers for treatment, improve support from friends and family, help practitioners better address family concerns, and use familiarity to improve hospitalization experiences.

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123. The Self-Identification Processes and Mental Well-Being of Students with Chronic Health Conditions and Disabilities at Chicago Universities

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Among U.S. undergraduate students, there is significant flexibility and change in their self-identification as having a disability [1], indicating a need to determine why this occurs. Prior research has begun to explore factors impacting disability identity development [2], but my study further investigates these processes and the impact of self-identifying as disabled on mental well-being. I hypothesized that factors such as interactions with others, ableism, exposure to disability studies, and understanding of disability would impact self-identification as disabled or another label, and that self-identifying as disabled and positive disability identity would benefit mental well-being. To investigate this, I conducted semi-structured interviews with undergraduate students at Chicago universities who both did and did not self-identify as disabled. I found that firsthand experiences and interactions with other disabled people led participants' understandings of disability to start encompassing a wider variety of conditions, including their own. Despite this, participants were still hesitant to apply the "disabled" label to themselves due to self-doubt, caused by invalidation from others and uncertainty in whether their conditions were "severe enough" to qualify as disabilities. Internalized ableism frequently hindered self-identification as disabled as well, by creating negative associations with disability. Conversely, diagnosis and interactions with other disabled people provided support and validation that promoted self-identification as disabled. Lastly, self-identifying as disabled had a variety of impacts on mental well-being. For some, it benefitted their mental well-being by connecting them to a community of other disabled people, or by helping legitimize their limitations. For others, it was detrimental to their mental well-being because they associated being "disabled" with experiencing pain and symptoms for the rest of their lives. Consequently, my findings challenge the assumption made in previous research that we should always aim for positive disability identity, instead demonstrating the harms of this generalization.

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124. Data-Driven Wellness: A Deep Dive Into Mobile Health Using Apple

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Smartphones and their respective applications are utilized by millions at astronomical rates [1]. This pilot study, a component of the larger project, investigated the relationship between physical activity and sleep in young adults by employing the Apple Watch, one of the most common smart devices on the market [1,3], highlighting its positive impact on student equity through increased accessibility, diverse representation, student empowerment, and equal opportunity for research experience. By doing so socioeconomic and geographical barriers to research involvement are removed [2], actively encouraging the inclusion of participants from diverse backgrounds by focusing on identifying health disparities within specific communities. Students are empowered through data-driven decision-making, learning to analyze personal health metrics and making informed lifestyle choices as physical activity influences sleep through various biological mechanisms, including decreased insulin resistance, reduced inflammation, and regulation of cardiac rhythm. Conversely, sleep deprivation can negatively impact physical and academic performance. Data collected from five young adults (n=5) over a seven-day period both day and night, tracking both step count and sleep duration using Apple Health data. Preliminary results indicated a complex relationship (R^2=0.818). While no direct correlation was found between daily step count and total sleep time across all participants, some individuals exhibited a connection between total sleep time and next-day step count (R^2=0.6728). This suggests that while overall activity levels may not directly influence sleep duration, the quality of sleep might play a role in subsequent activity levels.

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125. Fluid flows through square ducts with moving walls

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Fluid flow through pipes and ducts is relevant to many applications such as plumbing and HVAC systems. Flow through a square duct features phenomena that are not present in a circular pipe, such as the secondary mean flows that are generated near duct corners when the flow is turbulent. The secondary flows cause fluid circulation in a vortex-like form near the corners, which can increase friction and pressure drop compared to the circular ducts. To better understand this behavior, numerical simulations of laminar flow were conducted to characterize the effect of adding a small amount of a swirl by modifying the wall boundary conditions. The simulations utilize Semtex, which is a C-based programming software. Incompressible Navier-Stokes Flow equation, $\partial_t u + N(u) = -\nabla P + \nu\nabla^2 u \; with \; \nabla\cdot u = 0$, where u is the fluid velocity, P = p/ρ is the modified pressure, and $\nu = \frac{\mu}{\rho}$ is the kinematic viscosity. Transverse (non-streamwise) velocities on the four side walls were imposed to induce streamwise vorticity to the flow. After running the simulations, the energy of the difference between the streamwise velocity with and without a transverse velocity applied at the sidewalls was computed. For low sidewall velocities, this discrepancy increases with sidewall velocity, as would be expected. However, after the sidewall velocity reaches a critical velocity of around 0.1Umax (where Umax is the maximum streamwise velocity), this discrepancy counterintuitively decreases with increasing wall velocity. By visualizing the difference in the streamwise velocity with and without sidewall in contour plots, it was found that the difference is increasingly concentrated near the duct corners for the higher wall velocities. In the future, the cause of the increase and subsequent decrease in streamwise velocity difference as the wall velocity changes is to be further studied.

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126. Hepatocyte-Specific Deletion of the Novel Hexokinase, HKDC1 Protects Against Diet-Induced Obesity and MASH.

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Metabolic-associated steatohepatitis (MASH), the inflammatory stage of MASLD, will soon be one of the primary causes of liver-related complications. Its steady increase in global population is devastating. Between the two genders, women in menopause are suffering from MASH at similar rate compared to man due to estrogen deficiency. Our published data shows a clear positive association between the progression of liver disease and the expression of novel hexokinase HKDC1 in the liver. Targeting HKDC1 represents a highly selective approach. Therefore, we hypothesized that liver-specific deletion of HKDC1 will protect against diet-induced obesity and the progression of MASH to fibrosis. We used Albumin drived Cre mice crossed with HKDC floxed mice fed with western diet for 28 weeks to test our hypothesis. Our data shows that HKDC1 KO significantly decreases body weight and fat mass compared to its control with no changes in food intake and energy expenditure. KO mice maintain better glucose homeostasis with smaller livers, healthier liver parameters, less steatosis, and lower NAS and fibrosis scores, which are in agree with lower hepatic pro-inflammatory and pro-fibrogenic gene expression. Although we did not see any changes in triglyceride levels, there was a significant reduction of serum cholesterol concomitant with enhanced expression of cholesterol metabolism genes in the KO group. Our data suggest a promising protective role of HKDC1 KO in diet-induced obesity and MASH.

127. Utilizing CRISPR-Cas9 and ORF Gene Editing Approaches in Human Lung Cell Gene Expression

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Gene editing technologies have transformed biomedical research, enabling the precise manipulation of cellular genetic material to elucidate gene functions and expression levels. This study examines two gene-editing approaches—single-guide RNA (sgRNA)-guided CRISPR-Cas9 and open reading frames (ORFs)—to evaluate their efficiency in controlling gene expression and to determine their differential impacts in human lung cells.

The primary objective is to assess how expression levels, modulated through gene editing, influence cellular behavior within lung cells. In the sgRNA-CRISPR-Cas9 mechanism, sgRNAs guide the Cas9 endonuclease to a targeted genomic locus, inducing a double-strand break and creating the potential for precise gene editing through DNA repair pathways. Conversely, the ORF method involves inserting the gene of interest adjacent to a promoter, effectively ensuring consistent gene expression within the edited cells. The methodology utilized lentiviral vectors for both gene-editing approaches, allowing stable integration into the host genome and ensuring efficient gene delivery.

Results indicate that while the sgRNA and CRISPR-Cas9 approach yielded higher editing efficiency and specificity, the ORF insertion method produced more consistent expression and resulted in more pronounced and predictable outcomes. These findings suggest that while CRISPR-Cas9 may be more effective for high-precision targeting, ORF integration is superior in applications where consistent expression is critical for studying gene function, specifically, in respiratory cell models.

128. Trash Trap: Categorizing Aquatic Pollution in Chicago's Montrose Harbor

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Pollution of aquatic ecosystems by trash, including plastic, is a critical environmental and public health issue. The input and abundance of plastic to the environment is increasing and is worsened by climate change. Plastic litter poses a direct threat to both human and wildlife health through ingestion and entanglement. In addition, plastic particles leach toxic chemicals as they break down in the environment, creating low-level and persistent pollutant exposures. Lakes and rivers in urban areas are critical sites of litter input because they are closely connected to litter sources. Lakes and rivers are key sources of litter to oceans, and are far lower in volume. Thus, urban lakes and rivers are critical sites for litter prevention and removal. The objective of this study was to determine the types of litter that enter a Lake Michigan marina in Chicago. Marine debris was collected over eight weeks from Montrose Harbor in a Marina Skimmer. This device is largely submerged underwater, and uses a pump to draw in water and floating trash into its 15 m3 container. Trash was removed from the device approximately weekly. In the lab, the trash was dried, sorted, categorized, and weighed. Results indicated that the most prevalent type of debris collected was plastic. By category, the main types of litter were fragments larger than 3 mm and food related trash. Future research on this topic can be used to inform public education campaigns and policies relating to the most prevalent litter types at the site.

129. Investigating Displaced Amacrine Cells with Functionally-Independent Orientation-Selective Neurites

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Classically, neurons are described as integrating inputs throughout their dendrites and sending the received information as spike outputs down their axons. In a method known as subcellular processing, some neurons are also able to receive, process, and transmit information along specific neurites. The concept of neurons communicating along different parts of their neurites all at once presents incredible neural computational power. Amacrine cells (ACs) are a class of inhibitory neurons in the retina that have mixed inputs and outputs throughout their neurites. Thus, they have the potential for subcellular processing. There are over 60 types of ACs, some of which have already presented subcellular processing. A subset of ACs have proven to be orientation-selective at their somas, responding to light stimuli presented at a particular angle. However, if ACs are also communicating via subcellular processing, then they may have functionally independent, orientation-selective neurites. There are several orientation-selective retinal ganglion cells (RGCs) which receive information from ACs, but most of these ACs have not yet been discovered. This project explores many of the less well-characterized AC types that may compute stimulus orientation in their neurites. To determine if this is the case, we combined two-photon calcium imaging with visual stimulation in the *ex vivo* retina. We then investigated specific regions along the neurites of ACs which responded strongly to certain stimuli. Our data suggest the potential for the functional compartmentalization of orientation tuning in ACs. Ultimately, revealing the roles of amacrine cells in retinal computation will help understand their communication with RGCs and overall role in vision. Additionally, the results of this study may teach us general principles of subcellular processing in neurons.

130. Effect of Whole Blood Dietary Mineral Concentrations on Erythrocytes: Selenium, Manganese, and Chromium: NHANES Data

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Selenium (Se), Manganese (Mn) and Chromium (Cr) are dietary minerals shown to impact animal erythrocyte health. However, these minerals have not been studied to see how they affect human red blood cells (RBCs) and hematology. Using a subpopulation of 23,844 American participants in the 2015-2016 and 2017-2020 National Health and Nutrition Examination Survey (NHANES), we performed linear regression analyses to model the effects of Se, Mn and Cr on important indicators of human erythrocyte health: RBC count, hematocrit and hemoglobin levels. We evaluated sex, age, ethnicity, education, income and smoking status as covariates as well as employed subpopulation-exclusion regressions to examine the effect of deficiency and excess of these minerals. We used optimizable ensemble machine learning models to corroborate regression results. To further understand our preliminary analysis of the effects of Mn, we performed additional analyses to explore its effect on RBC hemoglobin, RBC distribution width, transferrin receptor concentrations, transferrin saturation and serum iron levels. Adjusting for covariates, Cr was inversely associated with RBC count, hemoglobin and hematocrit. Conversely, Se was positively associated with RBC count, hemoglobin and hematocrit. While Mn was positively associated with RBC count, it demonstrated an inverse association with hemoglobin and hematocrit. Overall, the effects of Cr were harmful to all subpopulations–at deficient, normal and excess levels–while Se was protective at all levels. Mn appears to contribute to the development of microcytic anemia, as supported by our more extensive analyses into the mineral, but only in subjects with clinically elevated Mn levels. Thus, excessive consumption of food and supplements rich in Mn and Cr could be harmful to human erythrocyte health.

131. A Microfluidic Platform for Personalized Immunotherapy Screening with Core-Needle Biopsies

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We developed a microfluidic platform capable of simultaneously evaluating the efficacy of ten immunotherapy drugs. Immunotherapy has emerged as a vital treatment in the fight against cancer, yet only a fraction of patients benefit from its use due to severe side-effects from imperfect medication. A key challenge is the absence of screening methods to identify the most suitable treatment. Due to the lack of a personalized immunotherapy screening (PIS) test, oncologists must empirically determine treatments which entail the risk of failure. Core needle biopsies, obtained through a minimally invasive procedure, preserve the tumor's composition, including its microenvironment and cellular diversity. Given the limitation of acquiring only 2–4 specimens per tumor, it is imperative to develop an assay that maximizes diagnostic capabilities. A microfluidic platform designed for high-throughput immunotherapy screening can effectively evaluate the efficacy of ten distinct therapies on a single core needle biopsy, enabling a more precise and personalized approach to cancer treatment selection. In this study, we developed a microfluidic device capable of testing ten distinct therapies on a single core needle biopsy. The device consists of ten channels below a tissue chamber where the biopsy can be exposed to each treatment in isolation. Currently, we have tested the device with up to 8 channels having proper diffusion into the tumor tissue and no cross-contamination between channels. A clear working principle has been established, warranting further investigation into expanding treatment applications and potential integration into clinical oncology to enhance personalized cancer treatment.

132. SEIR Disease-Spread Modeling with Physics-Informed Neural Networks

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Epidemiological modeling is crucial for understanding and predicting disease transmission dynamics. Traditional SEIR (Susceptible-Exposed-Infected-Recovered) models rely on ordinary differential equations with fixed parameters, limiting their adaptability to complex real-world scenarios. This study explores the application of Physics-Informed Neural Networks (PINNs) as an innovative approach to enhance the flexibility and accuracy of SEIR modeling. We implemented a PINN architecture using PyTorch to model COVID-19 spread dynamics based on data from South Korea. Four separate neural networks were constructed to represent each SEIR compartment, with physics-informed loss functions enforcing adherence to epidemiological constraints. The model was trained on 489 days of confirmed and recovered case data using Adam optimizer with L2 regularization and adaptive learning rate. Model performance was evaluated through comparison with traditional ODE solvers using identical parameters (β=0.132, γ=0.06, σ=1/5.2). The PINN-based model successfully captured SEIR dynamics while maintaining physical consistency with epidemiological principles. Loss convergence analysis demonstrated stable learning behavior, with final loss values reaching 10^-5 scale. Comparative analysis with classical ODE solutions showed comparable prediction accuracy, while the PINN approach demonstrated superior robustness when handling noisy data points. This study demonstrates that PINNs offer a promising framework for epidemiological modeling that balances data-driven learning with physical constraints, providing advantages in handling incomplete surveillance data while maintaining fidelity to underlying disease dynamics. Future work will explore the integration of time-varying parameters and additional compartments to model intervention strategies and vaccination effects, potentially offering more adaptive tools for public health response planning.

133. The Role of Adipose Tissue Extracellular Vesicles (A-EV) miRNA Cargo in Obesity-associated Diabetic Patients

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Diabetes, a rapidly escalating global health crisis, shares a profound association with cardiovascular disease (CVD). This relationship underscores the critical need for concurrently comprehensive strategies to manage both conditions. In recent years, there has been a burst in researching microRNAs (miRNAs), which are short-lengthed base pair RNAs that have been investigated as potential biomarkers for the diagnosis and prognosis of various diseases. While microRNAs have been extensively studied in various diagnoses, such as cancer, their role in the communication between adipose tissue and the heart remains relatively unexplored. Adipose tissue, once considered primarily a storage depot for excess energy, is now recognized as an active endocrine organ that secretes a variety of signaling molecules, including miRNAs, assembles them, and ships them to the epithelial cells of the heart through EVs (extra-cellular vesicles). We highly suspect those miRNAs play a crucial role in regulating metabolic processes, inflammation, and cardiovascular function. Adipose white tissue samples were collected from patients who consented to participate in the study and who underwent bariatric weight loss surgery at UI Health Hospital. They are categorized as lean/healthy, obese non-diabetic, and obese diabetic patient groups. miRNAs were then extracted, qualified, sequenced, and analyzed through bioinformatics. In simple terms, the results showed that adiposome concentrations were significantly higher in obese patients compared to lean controls. All 120 profiled microRNAs exhibited significant differential expression across diabetic, pre-diabetic, and non-diabetic groups, with diabetic patients showing the most pronounced changes. Several of these microRNAs have known associations with cardiovascular diseases such as hypertension, atherosclerosis, and cardiac hypertrophy, according to the literature. These findings provided valuable insights into the molecular mechanisms underlying the link between obesity, diabetes, and CVD, paving the way for future research and the development of targeted therapeutic interventions.

134. Kinetic Analysis of Specificity and Activity for Caspases 3,4, and 8 with Fluorogenic Peptide Substrates

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Inflammation and programmed cell death are associated with caspases, cysteine-dependent aspartate-directed proteases. Caspases 3 and 8, apoptotic caspases, are also associated with pyroptosis, which is initiated by the cleavage of substrates gasdermin D and gasdermin E. The development of a selective peptide substrate for each caspase can aid in the quest for potential therapeutic inhibitors, as well as the overall determination of the role of caspases in inflammatory disorders. Förster resonance energy transfer (FRET) based assays were completed to analyze the activity of peptide FRET substrates in the presence of caspases. Progress curves were conducted to assess the selectivity of each substrate for caspase 3 and 8, followed by Michaelis Menten kinetic assays, if selectivity parameters were achieved. Auto-proteolysis of caspases was identified and examined by varying the incubation time and concentration of caspases in solution to determine the difference in the rate constant for each time frame. Determination of selective substrates for individual caspases will allow understanding of inflammatory pathways, aid in the differentiation between caspase proteases, and assist in the development of specified inhibitors.
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135. Endothelial Ackr1 Knockdown Inhibits Neutrophil-Mediated Pulmonary Metastasis

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Metastasis is the leading cause of breast cancer-related mortality, however, the molecular mechanisms behind metastasis remain largely unknown. During metastasis, tumor cells detach from the primary tumor, enter the circulation, and spread to distant organs. However, the success of metastatic colonization is not solely determined by the tumor cells ability to disseminate; it is also critically influenced by the establishment of pre-metastatic niches in target organs. These pre-metastatic niches are specialized microenvironments that support the seeding, growth, and survival of incoming tumor cells. Neutrophils play a crucial role in forming these niches by promoting inflammation and releasing factors that facilitate tumor cell adhesion and extracellular matrix remodeling. In non-tumor contexts, extravasation of neutrophils into surrounding tissue is facilitated by expression of Atypical Chemokine Receptor 1(ACKR1) on endothelial cells, but this has not been examined in the context of metastasis. We hypothesize that eliminating endothelial ACKR1 expression may reduce neutrophil extravasation into the lungs, thereby disrupting the formation of the pre-metastatic niche and decreasing metastasis. To study the role of ACKR1 in neutrophil extravasation, we used immunofluorescent staining to analyze the distribution of neutrophils relative to ACKR1-positive versus ACKR1-negative vessels in lung sections from tumor-bearing mice. Our analysis demonstrated that neutrophils are preferentially localized adjacent to ACKR1-positive vessels. Additionally, we analyzed lung sections collected from ACKR1 endothelial cell knockout (ACKR1ECKO) and control mice treated with tumor-conditioned media (TCM) for nine days. Our findings revealed decreased neutrophil presence in the lungs of ACKR1ECKO mice compared to the control mice following TCM treatment. These results suggest that ACKR1 is a major player in neutrophil-mediated metastasis, enhancing the priming of the pre-metastatic niche and promoting subsequent metastatic colonization. Understanding this mechanism may open new avenues for therapeutic strategies aimed at mitigating breast cancer metastasis.

136. Whole-Brain Functional Connectivity Analysis of Cortical, Subcortical, and Brainstem Sensory Regions During Tactile Stimulation

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Functional connectivity (FC) analysis of correlated blood oxygen-level dependent functional magnetic resonance imaging (BOLD fMRI) signals can be used to determine networks of functionally connected brain regions. Furthermore, comparisons of FC at rest and during task demonstrate small but meaningful task-associated changes in coupling of spontaneous brain activity [1]. While both resting-state and task-based analyses have been conducted relevant to the tactile sensory system, whole-brain FC differences associated with limb-specific tactile sensation has yet to be studied in depth. Here, we conducted the first whole-brain FC analysis of cortical, subcortical, and brainstem sensory regions during non-painful tactile stimulation of the left hand, right hand, and right foot. We investigated the hypothesis that cortical/subcortical FC will change with limb-specific stimulation and that the novel inclusion of brainstem regions of interest (ROIs) will highlight additional functional connections from the dorsal column sensory network. We utilized a seed-based approach, wherein ROIs were identified from group-level activation maps, fMRI time series were extracted from each ROI and correlated on the subject-level, and group-averaged correlations were compared between task-free and task states. We found that interhemispheric S1 coupling during stimulation of the left or right hand was lower than that during the task-free condition. The same trend was not seen in interhemispheric S2 or thalamus coupling. Meanwhile, cerebellar/S1 regions corresponding to the same limb showed greater coupling than those corresponding to different limbs during task but not in the task-free condition. Finally, significant within-brainstem coupling was found between bilateral cuneate nuclei during both the task and task-free states. Our findings demonstrate that FC differences do exist between task and task-free states. Whole-brain mapping of these network reconfigurations is essential to better understand the sensory system in healthy individuals and clinical cohorts with disrupted sensory processing.

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137. Understanding Political Affiliation and Connections between Indian American Hindus and India

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India is currently experiencing right wing religious nationalism. The country is the world's largest democracy with a quarter of the world's voters. The BJP party seeks to redefine the basis of national identity to exclude and marginalize religious minorities, i.e. Indian Muslims. After independence from British colonialism, the secular state reduced the strict separation of church and state. Since 2014, the BJP, ruling party, has been proposing that Indian culture is coterminous with Hindu culture since the 1990s rather than the initial unity and diversity motto that many Indian political parties had previously. Now, in the 2020s in America, the non-profit Hindu Students Council (HSC) is the most extensive Hindu student organization in the United States. The organization, present on college campuses across the United States, allows members to learn about the spiritual and cultural elements of Hinduism and provides opportunities for educational and service events. The HSC is notable for providing a welcoming environment to cultivate the Hindu tradition, though its members also raise questions about its affiliation with the Vishwa Hindu Parishad (VHP) of America, which promotes Hindu nationalist agendas. A chronological timeline will be developed over the course of 2000-2024 of the origin, development, and impact of nationalist ideologies in the United States of America and India to do a comparative analysis of both countries to understand political affiliation ideological leanings of Indian American Hindus.

138. The Effect of CXCR-4 Oligomerization on Antagonist Binding Affinity

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G-protein coupled chemokine receptors facilitate the migration of leukocytes to sites of inflammation, infection, or injury. Excessive activation of leukocytes is observed in inflammatory diseases and many forms of cancer. Chemokine receptor antagonists are thus important targets for therapeutic development. Our research focuses on the CXCR-4 chemokine receptor and its clinical implications. We have found that chemokine receptor CXCR-4 forms oligomeric assemblies at high cell surface density, leading it to allosterically modulate its structure, remodel the ligand binding site, and enhance G-protein activation. It has been demonstrated that there is an increased presentation of chemokine receptors observed on the cell surface in oncogenic cells as well as in the cells of patients with neurological and neuroinflammatory diseases, resulting in the inflammatory response. We aim to understand how these oligomeric assemblies affect ligand binding, specifically in the context of the binding affinity of the CXCR-4 antagonist Plerixafor (AMD3100) as well as its endogenous ligand, CXCL-12. We have determined that oligomerization of CXCR-4 reduces its binding affinity for AMD3100 and also influences the protein's binding to CXCL-12. Further research into the effects of oligomerization on the binding affinity of therapeutics to their target receptor will allow for consideration of the efficacy of related chemokine receptor antagonists and promote the development of more effective therapeutics.

139. Dorsal Dentate Gyrus Engrams During Fear Learning and Generalization: Implications for Post-Traumatic Stress Disorder

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Post Traumatic Stress Disorder (PTSD) is a psychiatric condition that can develop after experiencing a traumatic event. It is twice as prevalent in females as it is in males. A hallmark symptom of PTSD is fear generalization, where individuals transfer fear responses from a specific cue or context to unrelated stimuli or contexts. We hypothesize that this arises from impaired memory-updating processes, where a failure to remap trauma-related memory traces in the presence of new information (e.g., safety signals), and the persistent recall of these memories in non-trauma-related contexts occurs. To examine these remapping deficits at the engram level, we studied male and female C57BLS/6 mice using a viral-based neuronal tagging strategy (i.e., Tet-tag) combined with immunohistochemistry and fluorescent confocal microscopy to examine the stability and flexibility of fear-related memory traces in the dorsal dentate gyrus of the hippocampus. Additionally, we tested whether fear generalization or remapping deficits could be predicted using acoustic startle reflex (ASR) as a pre-screen, where mice were parsed into susceptible and resilient populations. Contrary to our hypothesis, males exhibited higher startle reactivity, while females demonstrated a more adaptive fear response, reaching peak freezing earlier in a manner predictive of shock intensity. All mice generalized fear, and pre-exposure to a safe context reinforced this effect. Generalization corresponded with overlapping neural activity in safe and fear contexts, supporting the role of impaired memory-updating in PTSD. Finally, females showed a significant positive correlation between ASR and freezing in the safe context, suggesting ASR may predict PTSD susceptibility in humans.

140. Optimal Design of Precast Sections Fabricated with Novel High-Early Strength Concrete

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The optimal design of precast concrete sections is vital for advancing the efficiency, durability, and sustainability of modern construction practices. This study investigates the application of novel, high-early strength concrete in fabricating precast sections, aiming to enhance their mechanical properties and structural performance under flexural loading conditions. The primary objective is to evaluate key parameters, including flexural strength, crack resistance, and deformation behavior, through experimental testing. These tests focus on how high-early strength concrete influences the sections' load-bearing capacity in less than 24 hours, accelerates curing processes, and reduces cracking during handling and transport. Such improvements can significantly increase the turnover rate at precast facilities, shorten overall construction timelines, and yield substantial cost savings for projects. Furthermore, the design of sections using this novel concrete mix has the potential to lower environmental impacts by optimizing material use, reducing cement content, and consequently decreasing carbon emissions associated with production. This aligns with growing industry demands for sustainable building solutions. By providing an analysis of the structural benefits, this study offers practical insights for civil engineers and precast designers seeking to optimize concrete sections. The findings contribute to the broader adoption of high-early strength precast systems, balancing performance enhancements with environmental responsibility in construction.

141. Ribosomal Degradation via Ribophagy: A Potential Source of Nucleotides for DNA Damage Repair in Nutrient Starved Cells.

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Serine is a non-essential amino acid crucial in cell growth and maintenance, particularly in cancer cell proliferation, due to its downstream function in protein, lipid, and nucleotide synthesis. Serine auxotrophic tumors rely on the environment's serine for survival. There is increased interest in exploiting this vulnerability by using serine starvation as therapy for serine auxotrophic tumors, including in an ongoing clinical trial in pancreatic cancer. It is well established that serine starvation induces DNA damage. To better understand the cellular response to serine starvation, we conducted proteomic analysis in serine- and glycine-starved (-S/G) auxotrophic luminal breast cancer cells (MCF7). One interesting observation was a depletion of ribosomal proteins. Ribosomes primarily consist of ribosomal RNA (rRNA) and proteins; rRNA degradation has been previously identified as a nucleotide source under stress. These findings led us to hypothesize that ribosomal autophagy (ribophagy) could provide nucleotides to mitigate DNA damage in serine-starved cells. We performed liquid chromatography-mass spectrometry (LC-MS) metabolomics on serine-starved MCF7 cells to investigate this. We detected increased free pseudouridine, indicating RNA degradation, as uridine is only modified with pseudo groups when in RNA, suggesting that rRNA degradation occurs upon serine starvation. To assess ribophagy's role in DNA damage, we inhibited lysosomal function with chloroquine (CQ), which prevents autophagosomes from binding to lysosomes. Western blotting and propidium iodide staining revealed that chloroquine treatment increased DNA damage and cell death while reducing autophagy in serine-starved cells. Furthermore, we examined chloroquine in combination with methotrexate, a clinically relevant agent that induces DNA damage similar to serine starvation. Chloroquine enhanced methotrexate-induced DNA damage and cell death. Future research will focus on metabolomics to quantify ribosomal RNA and nucleotide levels in serine-starved cells treated with chloroquine. We hypothesize that rRNA degradation is a nucleotide source, alleviating DNA damage in serine-starved cancer cells.

142. GNSS Reflectometry for Ice Melt Detection: Signal-to-Noise Ratio Analysis in Antarctic

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Due to evident climate change effects observed over the history of the Earth, we look for preventative methods to identify, diagnose, and plan to mitigate climate change and its effects going forward. In this light, GNSS-R has been developed as a method to identify in a lightweight/efficient fashion. Specifically, through this work we are interested in trying to discover when ice surfaces are melting through a signal to noise ratio (SNR) computation in an attempt to diagnose current climate change conditions. We have a software-defined receiver that takes signals from the reflection of surfaces in Antarctica. The SNR computation follows the following algorithm: raw data files are recorded, passed through a preprocessing conversion, preprocessed result is then passed into a processing algorithm that calculates the signal to noise ratio observed in that surface condition. This algorithm computes the SNR for each second and accumulates the average over each minute. It is capable of processing multiple sample durations of raw data, for example: 1 minute, 3 minutes, 20 minutes. The GNSS-R setup includes a downward-facing left-hand circularly polarized (LHCP) antenna mounted on 9-meter towers, allowing efficient collection of reflected signals for post-processing and analysis. The goal of this study was to compute the SNR for a data campaign that took place from November 2023 to December 2024. Demonstration of a small sample size from the same campaign was previously processed and resulted in a partial correlation ($\rho = 0.75$) between a snow-covered ice surface and mean red value of camera pixels. These preliminary findings indicated promising potential for GNSS-R; however, further analysis is required to assess its feasibility for large-scale ice melt monitoring. Future work will focus on expanding the dataset and refining processing techniques to support broader implementation of GNSS-R as a remote sensing tool for climate change studies.

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143. Developing a Lysosome-Targeting Peptide Amphiphile for Protein Degradation

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Lysosome-targeting technologies are becoming an increasingly popular therapeutic approach for disease treatment via the degradation of target proteins [1]. A notable advancement, called lysosome-targeting chimaeras (LYTACs), allows for targeting of extracellular and membrane-associated proteins. LYTACs consist of a chain of mannose-6-phosphate (M6P) molecules attached to an antibody, which takes advantage of naturally occurring cation-independent mannose-6-phosphate receptors to constitutively traffic target proteins to lysosomes for degradation [2]. While effective, LYTACs may be limited by their complex synthesis, requiring extensive chemistry. In this project, we hypothesize that integrating the LYTAC approach into a peptide amphiphile (PA) system enhances tunability while also simplifying synthesis. PA molecules, consisting of an aliphatic tail linked to an amino acid sequence, self-assemble into diverse nanostructures. These nanostructures can also be functionalized with bioactive motifs to increase their therapeutic potential [3]. Here, we developed a lysosome-targeting PA by coassembling M6P-functionalized PAs with protein-targeting PAs. The latter were designed through either direct conjugation with an antibody or by incorporating the antibody's fragment crystallizable region into the PA sequence, highlighting the broad scope of this approach. Using transmission electron microscopy, we verified that co-assembly produces a micelle of a size suitable for cellular uptake. Live/Dead and lactate dehydrogenase assays demonstrated biocompatibility. We then evaluated the degradative efficacy of the PAs *in vitro* using HeLa cells and neurons, targeting therapeutically relevant extracellular proteins such as epidermal growth factor receptor, Amyloid-beta, and Apolipoprotein E. Western blot and immunocytochemistry analysis revealed PA and protein colocalization to lysosomes and significant reductions in protein levels, indicating successful degradation. With their straightforward synthesis, ease of design, and compatibility with other bioactive PAs, we believe lysosome-targeting PAs are an improved strategy for protein degradation.

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144. Ocular Macrophages Are Necessary for Choriocapillaris Maintenance

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Age-related macular degeneration (AMD) is one of the most common causes of blindness in the developed world. Variants in the complement pathway are strongly associated with AMD. Macrophages express multiple complement factors and receptors. Macrophage depletion via CSF1R pharmacologic inhibition decreases choriocapillaris vascular density, which is clinically associated with early and late-stage AMD. However, CSF1R receptor tyrosine kinase inhibitors have off-target effects that may confound this phenotype. Based on this data, we hypothesized that choroidal macrophages (CM) maintain choriocapillaris homeostasis. We generated Cx3cr1-CreER ; Csf1r-LoxP-stop-LoxP-DTR (Mac-DTR) mice to genetically ablate ocular macrophages. Four-week-old Mac-DTR mice were given 9 doses of intraperitoneal (IP) tamoxifen (100 mg/kg) injections over the course of 3 weeks to activate diphtheria toxin receptor (DTR) expression in cells that express both *Cx3cr1* and *Csf1r*. Mice were then given 4 IP injections of vehicle or DT (500 ng) over 4 days. Eyes were harvested Day 1 post-DT treatment for immunofluorescence imaging of retinal and choroidal wholemounts. We quantified macrophage density, choriocapillaris density, and the apoptosis marker: cleaved caspase 3 (CC3). DT treatment decreased microglia and CM density by 98.5% ($p<0.0001$) and 95.5% ($p<0.0001$), respectively, in Mac-DTR mice ($N = 7$-8 mice per group). Choriocapillaris density was reduced by 16.1% in Mac-DTR mice ($p < 0.0001$, $N = 10$-11 mice per group). CC3+ choriocapillaris cells were increased 5.2-fold ($p < 0.05$, $N = 3$ mice per group) in DT-treated Mac-DTR mice. DT treatment in Mac-DTR mice decreased microglia and CM numbers, and reduced choriocapillaris density via increased cellular apoptosis. These data suggest that microglia and/or CMs are necessary to maintain the choriocapillaris and prevent apoptosis. CM dysfunction is a potential contributor to choriocapillaris loss during AMD pathophysiology. Future studies will investigate CM depletion alone and the mechanism by which CMs maintain choriocapillaris homeostasis.

145. The Changing Influence of Social Ties on Undergraduate Health-Promoting Behaviors

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Social relationships influence health-related behaviors in myriad ways. The major life transition of moving to college, however, upends the social worlds of undergraduates and places them in a setting with both new peer groups and newfound agency over their physical well-being. While undergraduates often have nuanced understandings of physical health entering college, little research has explored how the social dimension of undergraduates' lives influences their health-promoting behaviors during this critical period of personal development. Using a survey ($n = 67$) and semi-structured interviews ($n = 20$), this study explores the influences of social ties on undergraduates' health-promoting behaviors by analyzing respondents' health-related beliefs as well as the health-related beliefs of their parents, close friends, and roommates. Regression models using preliminary data demonstrate that first- and second-year undergraduates' beliefs around health-promoting behaviors are most strongly associated with those of their close friends, while their actual health behaviors are more closely associated with those of their roommates and parents. Third- and fourth-year students' beliefs around health promotion, use of healthcare, and health-promoting behaviors show much stronger associations with their roommates and close friends than with their parents. All interview participants expressed an understanding of physical health and health-promotion, with the key barrier to engaging in health-promoting behaviors being lack of time. Interview participants also expressed learning key health-promoting behaviors–particularly surrounding diet, exercise, and sleep–from parent-figures and then continuing those behaviors in college. Participants' college friendships are often shaped and bolstered by shared health-promoting beliefs and behaviors creating cycles of reinforcement, building upon survey data suggesting increased association with peers' health-promoting beliefs and behaviors over time. These findings support prior literature on peer-targeted health promotion in higher education, and provide evidence in favor of creating university policies aimed to allow students time to engage in health-promoting behaviors on a routine basis.

146. Me vs We: Optimal Distinctiveness and Attachment Style in Romantic Relationships

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There is a variability in the amount of closeness people desire in their romantic relationships. This may parallel optimal distinctiveness theory (ODT; Brewer, 1991), which describes how people negotiate the balance between the desire to feel affiliated with versus distinct from others at the collective level. Attachment theory, which explains the tendency to behave in ways that regulate how close one is to their partner (Main et al., 1985), may inform one's optimal level of distinctiveness in relationships. People who are anxiously attached desire extreme closeness to their partner in times of distress, whereas people who are avoidantly attached draw away from their partner in times of distress to reestablish their independence (Simpson & Rholes, 2017). This research examines whether attachment style informs one's desired level of optimal distinctiveness in relationships, two concepts not yet studied in conjunction. In Study 1, 500 partnered adults responded to our survey including their romantic attachment, optimal distinctiveness, and relationship satisfaction. In Study 2, 300 partnered adults responded to manipulations of distinctiveness levels to assess differences in thresholds for affiliation and independence as a function of attachment style. Results of Study 1 suggest that, as predicted, attachment anxiety was positively associated with ideal time spent with partner, as well as to ideal closeness and ideal similarity; whereas avoidance was negatively related to ideal time with partner. Relationship quality was negatively correlated with discrepancies between ideal and actual closeness and similarity. Results of Study 2 are pending, but are hypothesized to demonstrate that attachment anxiety will be associated with a lower threshold for affiliation, whereas attachment avoidance will be associated with distinctiveness.

147. Covalent Organic Frameworks for Visible-Light-Driven C-H Bond Functionalization

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Covalent Organic Frameworks (COFs) are a class of porous materials formed by covalently linking organic building blocks to form extended two or three-dimensional structures. Because of their high crystallinity, permanent porosity, excellent stability, and synthetic tunability, the applications of COFs in catalysis have been extensively explored. In particular, by incorporating light-harvesting organic building blocks into their structure, photo-sensitive COFs can be synthesized for visible-light driven catalysis. In this project, a pyrene-based COF (pyCOF) is presented as a catalyst for blue-light-driven coupling of quinolines with toluene. The reaction is hypothesized to proceed via a hydrogen atom transfer (HAT) process at embedded pyridine N-oxide moieties in pyCOF, which generates benzyl radicals that couple with a quinoline derivative. Substrate screening revealed that pyCOF effectively catalyzes this reaction across a range of quinolines in yields of up to 98%. This work demonstrates the potential of COFs to serve as excellent HAT catalysts for light-driven reactions.

148. A Tale of Two Mutinies: The *Fames Revenge* and the End of Atlantic Piracy's Golden Age

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My project, *A Tale of Two Mutinies*, explores the Golden Age of Atlantic piracy through the story of one ship, the *Fames Revenge*. It began life as a merchant ship before its crew mutinied and became pirates, but the unique aspect of its story is that there was a second mutiny against its pirate captain. I use the story of the first mutiny to explore the conditions that allowed for the rise of piracy, however I argue that through the story of its second mutiny, we can see how and why the Golden Age ended. Namely, while some colonial empires initially supported piracy to prey on their imperial rivals, as trade became more important than pillaging, piracy outlived its usefulness and had to be stamped out. The ensuing war on piracy caused buccaneer culture to crumble, resulting in a crisis of leadership as seen in the *Fames Revenge*'s second mutiny. In order to tell this story, I explore the trial record of the mutineers and accounts of piracy published by contemporaries of the *Fames Revenge.*

149. Cellular Response to Nanoscale Curvature on Soft Nano-Bio Interfaces

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Previous studies have shown that membrane curvature induced by nanotopography are able to modulate cellular properties such as motility, shape, and stiffness through curvature sensing pathways. The RhoA pathway dictates endocytosis through more favorable formation of clathrin-coated pits and cytoskeletal rearrangements with formation of branched actin structures [1]. To determine if the RhoA pathway played a role in curvature sensing, RhoA activity was up- and down-regulated in SK-OV-3 cells cultured on gold nanoparticle arrays and immunoflourescent staining for dynamin was performed. It was concluded that the completion of endocytosis is upregulated at sites with nanoscale curvature when the RohA pathway is inhibited. To further understand the events leading to the activation of the curvature sensing response, co-localization of collagen and vinculin was tested in fibroblasts cultured on gold nanoparticle arrays. As nanotopographical cues lead to remodeling of the extracellular matrix (ECM) through formation of collagen fibrils in fibroblasts, it was hypothesized that membrane curvature leads to ECM remodeling, then integrin activation, and finally signaling of the RhoA pathway [2]. As co-localization of collagen and vinculin was observed, it indicated that collagen deposition is associated with actin accumulation, thus supporting the hypothesis. As the overall application for these findings is to create a device that interacts with soft tissues, these experiments must be repeated on a soft substrate as inflammation arises when soft tissues interact poorly with hard devices [3]. However, hard materials are crucial for its chemical and electrical properties used in drug delivery and biomolecular interactions. Additionally, current fabrication of AuNPs have challenges forming arrays on soft substrates or with uniform topographic patterns. So, I have demonstrated the possibility of a hard/soft device using solvent-assisted nanoscale embossing which solves current fabrication issues and maintains the functional aspects of the hard materials while being compatible to soft tissues.

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150. Donor Sperm Recipients' Conceptions of Race, Ethnicity, and Ancestry

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The American kinship model emphasizes the importance of shared socially constructed categories such as race, ethnicity, and ancestry. Previous studies have investigated the common practice of sperm banks and donor sperm recipients "matching" these categories between the donor and the recipient in order to promote kinship formation. While these studies have revealed that recipients believe race, ethnicity, and/or ancestry to generally impact kinship formation, they do not interrogate the logics that recipients use to arrive at this conclusion. I hypothesized that recipients extract additional information, such as assumptions about the donor's physical appearance, from the categorical information on donor profiles. Furthermore, I theorized that the kind of additional information that recipients extract from categorical information, and the specific goals — kinship formation related or otherwise — to which recipients apply this information, depends on the specific category (i.e. race, ethnicity, or ancestry) from which it is extracted. To test my hypothesis, I conducted interviews with 25 former or potential donor sperm recipients. I found that participants prioritized selecting donors that resembled themselves or their family in an effort to promote shared physical resemblance, and thus a shared bond, between recipient and child. Recipients used race and ethnicity filters as proxies for physical appearance. They generally felt more comfortable choosing a donor of a different ethnicity or ancestry than of a different race, citing greater concern about physical variation between races than within one. Recipients valued shared ethnicity and ancestry for their perceived impact on less physical aspects of kinship, such as a sense of shared history between parent and child. That said, recipients commonly prioritized the physical look of a donor (determined based on race information, photographs, and descriptions of hair and eye color), over shared ethnicity, implying that recipients prioritize the physical aspects of kinship formation over the less-tangible.

151. Beyond Surgery & Hormones: Community-Specific Gender-Affirming Care, Research, & Innovation

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Despite recognizing that the goal of gender-affirming care is "to partner with [trans and gender-diverse] people to holistically address their social, mental, and medical health needs and well-being while respectfully affirming their gender identity" [1], the World Professional Association of Transgender Health's (WPATH) Standards of Care, version 8 (SOC-8) fails to expand upon vague calls for social services and accessibility, offering limited actionable guidance for clinics to provide social services and ensure their care is accessible. This paper analyzes the crucial community-specific gender-affirming practices beyond hormones and surgery at clinics in three urban environments in the U.S. and Thailand, including community-based research, clinician training, patient and family education, and social and financial support services that enable greater accessibility of care. I conduct and analyze interviews with clinicians and staff members, record participant observations, and assess patient-facing materials from three clinics: Tangerine Community Health Clinic in Bangkok, Thailand, Fenway Health in Boston, MA, and Howard Brown Health in Chicago, IL. Rather than secondary additions to clinical care, I argue that these services are an integral part of offering gender-affirming care deserving of greater attention in the field to advance WPATH's mission of improving the quality and accessibility of trans health.

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152. After a Mass Shooting: Effects on Personality, Community, and Gun-Ideology

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Between 2014 and 2023, there were 4,684 mass shootings in the United States [1]. The societal costs of these tragedies extend beyond those who directly experienced the event and can have lasting impacts on the community involved [2]. Mass shootings are events that can change the course of individuals' lives, status, and relationship to their environments, and have the potential to influence people's personality traits [3]. The frequency and widespread impact of mass shootings underscore the importance of understanding how these traumatic events impact individuals, communities, and gun ideology so as to improve recovery processes and advocate for gun control. This project focuses on the mass shooting in Highland Park, Illinois, on July 4th, 2022, through semi-structured interviews with 10 residents of Highland Park who were present and not present at the shooting. We investigated the influence of this mass shooting on individuals' personalities, mental health, community, gun ownership, and gun ideology. Preliminary findings show that residents used community resources and sought connections with others to share experiences in the aftermath. Residents noted that they previously lived in a now-ruptured "bubble" and described the tight-knit community both before and after the event. They claim to be now more conscious of the reality of gun violence. No individuals purchased guns following this event. Previous gun owners did not observe a change in their feelings toward their gun ownership after the shooting and were unaware of local gun policies. Still, all individuals stated a desire for stronger gun control policies and background checks, relating this need to the shooter's father who approved his gun purchase. With continued research into the influence of mass shootings, we can hope to mitigate the negative influences from these tragic events, bring communities together, and advocate for stronger gun control legislation.

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153. Constructing the Largest Ever 3-Dimensional Turbulence Box

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The study of particles, droplets, or flying vehicles and their interaction with turbulence is difficult in wind tunnels due to their tendency to be advected away from the test section. A solution to this issue is to study the effects of turbulence on objects in a turbulence box, which generates a volume of turbulence without a mean flow direction [1]. Previous air turbulence boxes have been characterized by 2D measurements [2], but a turbulence box designed to utilize state-of-the-art advancements in 3D characterization has not been realized yet [3]. The purpose of this project is to design, build, and test a turbulence box specifically with 3D measurements that will enhance the current state of turbulence interaction studies. This box has an octagonal geometry, with four inward-facing walls of air jets, over six feet tall, separated by four acrylic walls for optical observation and 3D particle tracking. So far, individual components have been successfully tested in a benchtop setup driven by Python. Forcing schemes for the jets were intended to be run on MATLAB, which ended up being incompatible with the controller. Results indicate that 24 Volts and 10 Amps will need to be independently supplied to each wall of jets and that potential back electromotive force caused by 96 solenoid jets per wall is not a concern. By methodically increasing the complexity of benchtop testing, the design is confirmed before being implemented. The insights that will follow demystifying the impact of turbulence on particles set up more research on other entities, including drone stabilizer responses in sudden gusts to the interaction of small flying insects with turbulence.

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154. Investigating Bioactivity of Sugar Peptide Amphiphiles in a Human Spinal Cord Organoid

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Spinal cord injury (SCI) affects over 250,000 people in the US, with more than 12,000 new cases reported annually. Post SCI, glial scar formation creates both physical and biochemical obstacles to axonal regeneration. Chondroitin sulfate proteoglycans (CSPGs), key inhibitors of axonal regeneration, consist of a core protein with sugar side chains that bind receptors such as RPTPσ. Conversely, heparan sulfate proteoglycans (HSPGs), which differ from CSPGs primarily in the stereochemistry of their polysaccharide backbone, interact with the same receptors but promote axon growth, migration, and synaptic connectivity. This contrast suggests that mimicking HSPGs could help counteract CSPG-induced inhibition [1]. The Stupp Laboratory has developed a class of peptide amphiphiles (PAs), which self-assemble into high-aspect-ratio supramolecular nanostructures in water. Inspired by previous success of sugar-based PAs for spinal bone regeneration [2], this study investigates a new class of sugar-based PAs consisting of synthetic heparan sulfate disaccharide that represents key motif in nature heparan sulfate. To evaluate therapeutic potential of this sugar-based PA, human spinal cord organoids derived from induced pluripotent stem cells were treated with various sugar PA concentrations in healthy and injured conditions. Organoid responses were then assessed via LDH cytotoxicity assays for cell viability and immunohistochemistry for axonal growth. Our observations identified 10% as the most bioactive concentration, as indicated by significant TUJ-1+ neuronal growth in healthy organoids. Fluorescent labeling confirmed PA adhesion to injured organoid surface. PA treatment has exhibited strong bioactivity, promoting neurite regrowth (mean length 781.7 μm) even in the presence of exogenously added CSPGs while neurite in control grew only 264.2 μm. This research highlights human injury organoids as a novel model for screening sugar-based PAs as potential therapies for chronic SCI. Given their ability to counteract CSPG-induced inhibition, future studies would explore the therapeutic potential of our PAs in animal models with chronic SCI.

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155. Colonial Legacies and Co-Ethnic Repatriation: West Germany and South Korea in the Early Cold War (1950-60s)

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The paper examines how state governments repatriated foreign-born co-ethnics and why they sometimes accept or exclude them. Specifically, it examines why, in the early Cold War (1950-1960s), West Germany actively promoted the repatriation of ethnic Germans under the Federal Expellee Law of 1953, while South Korea did not implement an official policy for the return of Korean Chinese migrants. I hypothesized that colonial history influenced the repatriation policies of West Germany and South Korea. Specifically, while both countries experienced forced migration, had *jus sanguinis* nationality laws, and were divided states, their contrasting colonial histories—Germany as a colonizer and Korea as a colonized state—shaped their approach to repatriating foreign-born co-ethnics. To test the hypothesis, I employed John Stuart Mill's method of difference as a hypothetical framework and used primary legal documents and historical archives in Korean, German, and English. I found that Germany's colonial experience allowed its ethnic project to frame ethnic Germans as rightful returnees, granting them citizenship rights. Nevertheless, they were discriminated against by native Germans despite their legal status. They thus leveraged their political networks to wield strong policy influence within the parliament and enhanced their social status as expellees. The paper coined such strategic political mobilization to enhance integration as *complementary ethnic capital*. In contrast, South Korea's colonized experience shaped its repatriation policy to be selective, prioritizing Zainichi Koreans over Korean Chinese due to the latter's stronger political and linguistic ties to China and North Korea. This exclusion led many Korean Chinese to re-migrate to North Korea, illustrating a different form of ethnic capital. This paper defined their response—adapting to exclusion by seeking integration elsewhere—as *reactionary ethnic capital*, highlighting how marginalized co-ethnics navigate restrictive repatriation policies. By highlighting refugees' agency, this research offers insights into the long-term

impact of colonial legacies on contemporary citizenship and integration debates.

156. Characterizing the Secretory Mechanism of a Novel Peptide Through an RNAi Screen in *Drosophila*

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Advances in sequencing and proteomic technologies have revealed a class of understudied peptides translated from short open reading frames in eukaryotes. One of these, the novel peptide Dafcin, is expressed in the ovaries of the fruit fly *Drosophila* and has been shown to traffick a fused GFP cargo from the ovarian follicle cells to the oocyte. However, Dafcin-GFP's secretion mechanism is poorly understood as it lacks the N-terminal signal peptide characteristic of canonical secretory proteins. Dafcin-GFP is predicted to adopt an amphipathic α-helical configuration, a common feature of molecules that interact with lipid membranes. This structural arrangement may facilitate an interaction with lipid bilayers and enhance transport out of the follicle cells. While untagged GFP markers remain in follicle cells, Dafcin-GFP is transported to the oocyte. Additionally, in stage 10B follicle cells, Dafcin-GFP associates with the Golgi complex indicating a possible role for the Golgi in mediating Dafcin-GFP secretion, although definitive evidence is lacking. To investigate the hypothesis that Dafcin-GFP utilizes a noncanonical secretion pathway, I have employed RNAi knockdown of secretion genes in the follicle cells, including Sec23 and Grasp65, which regulate transport from the ER to the Golgi and through the Golgi, respectively. To assess the secretion properties of Dafcin-GFP, I have identified canonically secreted GFP-marked proteins that can be compared to Dafcin-GFP: Cp7Fc-sfGFP, a chorion protein involved in eggshell formation that follows the canonical secretory pathway, and wgSS-sfGFP, a GFP fusion protein that contains the N-terminal signal sequence of the protein Wingless. Because the wgSS-sfGFP transgene and the follicle cell Gal4 driver used to drive expression of the RNAi transgene are on the second chromosome, I have recombined them onto a single recombinant chromosome. By systematically analyzing the secretion patterns of Dafcin-GFP, this study aims to clarify its transport mechanisms and broader implications for noncanonical secretion pathways.