GRADUATE RESEARCH SYMPOSIUM
PARTICIPANT ABSTRACTS

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Linguistics
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“Coordination strategies in Ombeayiüts”

This work examines and provides a broad overview of the different strategies Ombeayiüts speakers employ in coordination constructions. It describes the basic patterns utilized in each semantic type of coordination (conjunctive, disjunctive, and adversative) with a diverse set of categories (NPs, VPs, adjectives, and clauses). Ombeayiüts is one of the four speech varieties of Huave, an endangered Mesoamerican isolate spoken by an estimated 18,000 people in the Isthmus of Tehuantepec, Oaxaca, Mexico.

The data collected demonstrates that Ombeayiüts adopts different coordination strategies for each semantic type of coordination: zero-marking for conjunction, monosyndetic for disjunction, and monosyndetic with Spanish lexical borrowings for adversative. In additive coordination constructions, it can be observed that zero-marking is the default strategy for all categories: adjective phrases, noun phrases, and verb phrases. However, there are additional conjunctive strategies available to speakers. Given that the speakers inhabit a highly bilingual community undergoing widespread language shift, it is common for them to borrow coordination markers and patterns from Spanish. This work analyzes whether these borrowings are category-sensitive and in which contexts do they seem to replace the native conjunctions.

Furthermore, in Ombeayiüts conjunctive constructions, in addition to the zero-strategy and lexical borrowing of conjunctions, there are instances in which speakers employrehon(v)-1. (e)p (h)Tj3>eh (r

to contain high-quality tuples. We show that the optimal weights can be computed using continuous submodular maximization. As a running example, we apply our algorithm to the setting of training data acquisition for active learning.

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Results. We developed a model and software to estimate RNA melting of duplexes and hairpins. This estimates melting temperatures, the temperature at which half of RNA strands are denatured, and equilibrium concentrations of interacting strands. We also show that this software can inform the design of small model systems by identifying models that will form alternative structures during melting experiments. This software will be made freely available as part of the RNAstructure (l)3 (y)1 (

In James Fenimore Cooper’s novels 'The Pioneers' (1823) and 'The Chainbearer' (1845), the frontier in Upstate New York resembles what Mary Louise Pratt calls a contact zone in which American ideals, alterity, and notions of property are negotiated among landlords, squatters and other social outsiders, and Native Americans. The novels are set after the American Revolution, a time during which extensive land surveys were conducted and a Cartesian grid laid out, which not only facilitated land sales to benefit the state but also introduced Enlightenment idea(l)s in the wake of its advancement. However, the desi wa (w)-3(but)2 (a)-4 (l)-1 (c3l 8sDp m [(I)4 (n J)3) 6oputque(t)2 (y)-3 ((a)-4 r-4 (nd bs) 8sDp m [que(t)2 ng onlr graeainut azp m [lnd notied ai wdvsn the wake h (r)3 sheevndpenı

near infrared fluorophore (IR78), which will allow fluorescence-guided surgery and photodynamic therapy (PDT) for BrCa.

In this study, murine BrCa models were developed by initiating EMT6 tumors in the mammary fat pad of female BALB/c mice (n=8) through injection of 10^6 BrCa cells. To test these probes *in vivo*, one group of mice (n=4) received free IR78, and the other group (n=4) received 18-4 conjugated IR78. Longitudinal full body fluorescence images were obtained by capturing a series of eight images, each with an exposure time of 10 seconds. Each image was then flat-field corrected and montaged using an estimated 2D elliptical Gaussian function.

From the longitudinal fluorescence measurements, we found that the fluorescence intensity at the tumor region is higher and will last for long time using the 18-4 conjugated IR78 than free IR78. That encourage us to further investigate its potential in fluorescence guided surgery and PDT of BrCa.

Yuanhao Li
Brain and Cognitive Sciences
Division: Natural Science

"Ultra-fine knowledge of gaze position in saccade planning"

Sensorimotor integration is an important component of spatial representations, as retinotopic information needs to be combined with extraretinal knowledge about eye movements to properly locate objects in space. Recent research has shown that extraretinal oculomotor knowledge extends to fixational drift, the persistent wandering of the eye in between saccades: human observers are capable of inferring geometrical configurations purely based on motor knowledge of eye drift. Here we examine whether extraretinal information about fixational drift is also used to control eye movements. Specifically, we study whether saccade planning takes into account drift-induced displacements of the line of sight from the intended fixation location.
Observers maintained fixation on the location P0 of a previously briefly displayed marker in complete darkness during which the eye drifted to a new location PE. A sacclon lo ofo re(of)3 10 Td [(n ( )]e)7 (y

attention can influence processing in various visual regions, debate persists regarding its timing, particularly its influence on initial afferent activity in early visual cortices. In this study, we aimed to address this question using human electroencephalography. We utilized the C1 component, which serves as a measure of initial afferent activity. To evaluate goal-directed attentional modulation, we used alpha-band activity (8–14 Hz), a well-established neural marker of sensory suppression. Participants detected targets at a cued location while distractors (i.e., task-irrelevant stimuli) were presented at a non-cued location. We first replicated attentional modulation of the C1, and then replicated an increase in alpha band power over regions representing task-irrelevant sensory information—evidence of the alpha-related suppression. From this, we moved to investigate the relationship between C1 amplitude and stimulus alpha power. The results revealed that higher alpha power was associated with lower C1 amplitudes at the distractor location and higher C1 amplitudes at the target location (i.e., at the attended location). This pattern of results was replicated in the majority of participants at the single-subject level. Overall, our findings provide the first evidence that initial afferent activity in early visual cortices can be actively suppressed through goal-directed, alpha-related gating of sensory processing.

Matthew Loman
Earth and Environmental Sciences
Division: Natural Science

“Development of a high-resolution gridded inventory of anthropogenic methane emissions in New York State”

Anthropogenic sources of methane have been an important area of research in recent years, as municipalities such as New York State (NYS) have begun to mandate methane emission reductions for their benefits to both air quality and climate. In preparation for top-down inverse modeling to

losses are observed that scale unfavorably with larger machines. To overcome this, several material modifications to 304L stainless steel are being explored.

Here, we present a load geometry designed to test these material modifications with Sandia's MAVERIC-1 pulsed power drivers. The test fixture features a parallel plate region that is scaled to create highly uniform electric and magnetic fields like those seen in Z, and the impact of a material treatment can be gauged by measuring the amount of plasma that is formed upon applying a pulsed current. Additionally, we present the development of a numerical model being built to study the desorption of gasses from steel, which we hope will provide insight to the amount of plasma formation observed in our experiments. In particular, we are interested in the desorption of hydrogen which is heavily impacted by the grain structure of the steel.

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Hailemariam Mitiku
Chemistry
Division: Natural Science

“Synthesis, Reactivity, and Photophysical Properties of Pyridone-supported Bimetallic Ni(I) Complexes”

Pyridones make up an important class of ligands that can be involved in metal-ligand cooperativity (MLC). They form the reactive center in mi7Mmi7MmRa Td [(()6 (M4 (o)4 (p)4 (e)(()6 i)3 (pfdy7S

choices in any given color pairing). Interestingly, dyads maintained their conventions even when they were given visual access to their partner's screen, despite the availability of an alternative, potentially simpler, cognitive strategy. We hypothesized that these differences are rooted in the extent to which human subjects are prompted to employ cognitively less or more sophisticated processes, which were assessed via self-reported strategies. We discuss our results in light of how animal, including human groups solve coordination problems, with significant implications for our increasingly interconnected societies.

Mohammad Elious Ali Mondal
Chemistry

Hinglish is the umbrella term that encompasses both “indigenized Indian English forms” and “code-switching practices unintelligible to Monolingual Hindi or English speakers” (Parshad, Bhowmick, Chand, Kumari & Sinha 2016). Speakers below the age of 35 in India use this language variety. While the effects of this hybrid variety on Hindi are a relatively understudied phenomenon, the most major influence it has had on Hindi is that of /ɦ/ deletion. This study uses a corpus to analyze non-linguistic factors such as gender, regional identity, and use of transliterated orthography to provide evidence for the popularity of this deletion across all Hindi varieties and study the sociolinguistic motivations behind this deletion.

In Hindi, /ɦ/

the histone chaperone Anp32e may serve this function. Second, do flies have additional buffering mechanisms beyond what is already characterized? I have found that loss of fly Anp32e leads to increased nuclear H2A.Z levels and altered developmental timing. Finally, are there additional consequences to failed buffering? In fly embryos, elevated H2A.Z in flies results in increased nuclear falling, a phenomenon associated with DNA damage. I will use TUNEL to determine whether the falling observed is the result of DNA damage. My project will begin to address these questions and expand on the how and why of histone buffering in early embryogenesis.

Alison Salamatian
Chemistry
Division: Natural Science

"Selective CO_2 Reduction by a Synthetic Biocatalyst"

Cobalt-mimochrome VI*a (CoMC6*a), a synthetic m-ir9(i)13 [(S)3 1(e)1 (l)3 (e)1 (c)1 ti Bnooleeeee(c

Yusuke Satake
Philosophy
Division: Humanities

“Absence as Indeterminacy”

Negative truths have long baffled truthmaker theorists. The problem is as follows. Some negative truths are true because of how the world is. If so, there are worldly facts that make such propositions true. However, then, it seems that what is not must be part of the world, a collection of what is. Indeed, unicorns don’t exist not because unicorns’ absence is part of the world but because unicorns are not a portion of reality. After all, how can the world make negative truths true? To solve the problem, I will propose a view that some negative propositions are neither true nor false and require no truthmakers. True negative propositions are made true by some positive facts incompatible with their falsity. To motivate this idea, I will first discuss three extant approaches to the problem of negative truths: negativism, holism, and incompatibilism. The first two impose unreasonable ontological cost, existence of absence, while the third doesn’t explain some negative truths. Given this, I will argue that the problem should not be settled merely by an ontological consideration of what makes negative truths true but also by a semantic consideration of what negative propositions are true. In the second part, I will flesh out my view. As for ontology, I will argue that absence falls into two kinds: absence as incompatibility with positive facts and absence as indeterminate existence. As for semantics, I will propose a trivalent framework allowing for the value of indeterminacy to make sense of absence as indeterminacy.

Sarah-1 (C /P88 0t)2 (3 (or)3 ()6 ()10 N- CID cC ETo3 (n)4 (c)1

across the United States, juxtaposing them with the US Housing Index. Granger causality tests are deployed to determine whether one time series can aid in predicting another, revealing significant causal relationships at particular lags. This suggests a multifaceted correlation between economic conditions and social health dynamics. The research enhances our understanding of the predictive capacity of economic indicators for social issues, underlining the value of informed policy interventions. It posits that the US Housing Index's temporal changes Granger-cause Substance Abuse, meaning the housing market could potentially forecast substance abuse trends, assuming no other time series affects the period studied.

Ayoub Shahnazari
Mechanical Engineering
Division: Engineering & Mathematics
“Generating Synthetic 2D XRD Patterns for Advanced Deep Learning Analyses”

Two-Dimensional X-Ray Diffraction (2D XRD) is an advanced technique used for the analysis of materials. Unlike traditional X-ray diffraction methods that provide one-dimensional data, 2D XRD captures diffraction patterns in two dimensions. This allows for more comprehensive information on the structure, phase, orientation, and strain of materials.
2D XRD patterns can be classified into two main types: ring patterns (for polycrystals) and spot patterns (for single crystals). In this project, we have focused on generating synthetic 2D XRD spot patterns.

Alicia Shipley
Biology
Division: Natural Science
“The role of Impa2 in histone exchange and organization of chromatin structures”

Earth and Environmental Sciences
Division: Natural Science

“Measuring Lobate features on Mars and determining the scaling relative to terrestrial solifluction patterns”

Solifluction lobes, large-scale soil patterns commonly observed on Earth's hillslopes in cold environments, form due to frost-heave processes. Recent studies have proposed that similar patterns found on Mars may be valuable paleoenvironmental indicators, but it remains unclear whether they form from the same icy processes as solifluction lobes on Earth. Solifluction lobes have recently been theorized to exhibit a non-linear scaling with lobe height and topographic slope, based on a physical mechanism akin to fluid instabilities found at flow fronts. Initial studies using a large dataset of solifluction lobes in Norway corroborated this theory, with climate indices found to control absolute lobe size. Here we utilize Digital Terrain Models (DTMs) created from the High-Resolution Imaging Science Experiment (HiRISE) camera to determine whether lobate patterns in several Martian craters exhibit the same scaling as solifluction lobes on Earth. Our findings suggest similar scaling and morphology on Earth and Mars, with possible implications for our understanding of Martian surface processes and past climates. We have implemented new semi-automated methods for accurately determining lobe morphology on Mars, using flow direction and the steepest slope to calculate lobe heights and wavelengths with increased precision. These techniques have also been applied to our terrestrial data, enhancing the accuracy of our planetary comparisons. Our refined methodologies offer an improved understanding of solifluction lobe morphology, and the parallel a s (r)3 tper 6#

Perfluorocompound gases (e.g. CF4, C2F6, and NF3) play pivotal roles in semiconductor

Quasi-parallel collisionless shocks (in which the shock normal is approximately parallel to the background magnetic field) are believed to be the most efficient accelerators in the universe. Our NIF (National Ignition Facility) experiments in FY24 will be the first experiments to achieve the formation of a quasi-parallel collisionless shock in the laboratory. Compared to perpendicular shocks, quasi-parallel shocks are more difficult to form in the laboratory and to simulate because of their large spatial scales and long formation times. Our 2-D particle-in-cell simulations show that the early stage of quasi-parallel shock formation is achievable at the NIF, and that particles accelerated by diffusive shock acceleration are expected to be observable experimentally. Repetitive ion acceleration by crossings of the shock front, a key feature of DSA, is seen in the simulations. Collisionless dissipation mechanisms and particle spectra for different magnetic field angles to the shock normal will be presented.

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Yineng Zhao
Materials Science
Division: Engineering & Mathematics

“Artificial SEIs by Ultrathin, Conformal Fluoropolymers for High Coulombic Efficiency Lithium Metal Anodes in Dilute Electrolytes”

An ultrathin conformal layer of fluoropolymer (< 30nm) was engineered as an artificial solid electrolyte interphase at a Li metal/liquid electrolyte interface via initiated chemical vapor deposition. The F-rich ASEI improved the average Coulombic efficienc