Office of Undergraduate Research
Lamar University

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2026 Annual EXPO Conference

April 30th – May 1st, 2026

Location: **Setzer Student Center**

Book of Abstracts

Part I - Oral Presentations

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Glossary:

GR means Graduate student.

UG means Undergraduate student

H – Humanities, Arts, Social and Behavioral Sciences, Education, and Business

S – Science, Technology, Engineering, and Mathematics

UG-H means Undergraduate student in HASBSEB area.

UG-S means Undergraduate student in STEM area.

URG means Undergraduate Research Grant program of the Office of Undergraduate Research at Lamar University.

NSF means National Science Foundation.

McNair, Beck, Welch, and other sponsorship programs are indicated.

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OFFICE OF UNDERGRADUATE RESEARCH
LAMAR UNIVERSITY

P1 – STEM Plenary Session

Location: Live Oak Ballroom A&B

Chair: Dr. Ashwini Kucknoor

GR-S / Advanced
P1 – T#1

Presenter: **Uche Oparaji** [$]
Major: Medical Student
Email: ucoparaj@utmb.edu
Mentor: **Dr. Lauren Richardson** [#]
Co-authors: Arman Chowdhury [$], Avinav Sanjel [$], Pilar Flores-Espinosa [#], Souvik Paul [#], Ana Paula Pereira Guimaraes [#], Jessica Selim [#], Ananth K. Kammala [#], and Ramkumar Menon [#]
[$] John Sealy School of Medicine, UTMB, Galveston, TX
[#] Division of Basic Science and Translational Research, Department of Obstetrics and Gynecology, UTMB, Galveston, TX

The Fetal–Maternal Interface Reconsidered: Cellular and Lineage Perspectives on the Placenta and Fetal Membranes.

Introduction: Two fetal-maternal interfaces (FMi) exist during pregnancy: the placenta/fetal membrane-decidua, both of which are essential for fetal maturation and homeostasis. Fetal or maternal cell origin significantly affects the function and genetic makeup of each cell layer within these two FMis. Dogma stating "the placental and fetal membrane are fetal in origin" has begun to be questioned due to new proteomic analysis of these tissues. We hypothesize that some placental/fetal membrane stromal cells originate from maternal decidualized endometrial stromal cells (ESCs) during FMi fusion, creating redundant interfaces that maintain homeostasis.

Methods: Primary fetal (amnion epithelium-mesenchyme, chorion trophoblasts-mesenchyme [CMC], placenta trophoblasts-stroma [PSC]) and maternal cells (decidua) were isolated from term FMis (N=3) and compared to ESCs. To classify cell origin, morphology (microscopy), proteome profiles (LC-MS/MS), expression of endometrial-enriched genes (ProteinAtlas) within progesterone regulation pathways (western blot), secretomics (hormone/cytokine multiplex), and chromosomal analysis (CISH staining) were conducted.

Results: PSC and CMC expressed mesenchymal morphology, high proteomic correlation ($R \geq 0.9$; $R \geq 0.8$), similar progesterone regulatory element expression (PRA:PRB+; HOX11A+), and secretome profile (IGFBR1+; prolactin+) compared to maternal cells. However, PSCs express minimal transporter proteins compared to CMCs and maternal cells. Placental/fetal membrane trophoblasts and amnion epithelium exhibited an epithelial morphology, low proteomic correlation, differential transporter protein, lack of progesterone regulatory element expression, and male chromosome staining compared to maternal cells.

Conclusion: The placenta/fetal membrane are not fully fetal in origin. PSC and CMC are maternal in origin, derived from the endometrium, and form redundant FMis that may support pregnancy homeostasis and or contribute to pathology.

Presenter: Campbell Fuller [$]

Major: Biology

Email: cfuller6@lamar.edu

Mentor: **Dr. Susantha Ganegamage** [#]

[$] Department of Biology, Lamar University

[#] Department of Chemistry and Biochemistry, Lamar University

UG-S / In-Progress
U.R.G. Project
P1 – T#2

Design and Synthesis of Carbazole-Derived Mono- and Dual-Emission Fluorescent Probes for Selective Recognition of Telomeric G-Quadruplex DNA.

Cancer cells protect themselves from death by repairing the protective caps at the ends of chromosomes, called telomeres. In these telomeres, DNA can fold into unconventional structures called G-quadruplexes that play a critical role in how cancer cells survive and grow. If we can develop molecular probes that fluoresce when they bind with G-quadruplexes, they can be used as a diagnostic tool for cancer at the molecular level. This project focuses on designing and synthesizing two novel fluorescent probes based on a carbazole chemical scaffold. Carbazole was chosen for its planar aromatic structure, promoting **π-π** stacking interactions with the G-quartet planes of G-quadruplex DNA. Carbazole's distinct fluorescence activity makes it an excellent starting point for fluorescent probe design. One probe, named SKG-IX-29, was designed to emit a single wavelength of light, and SKG-IX-22 was designed to emit two different wavelengths of light, allowing for a built-in confirmation signal when bound to the G-quadruplex target. Both molecules were synthesized through multi-step synthetic routes and functional group modification to the carbazole core. Molecular structure was confirmed using NMR and IR spectroscopy. Work is currently being done to measure how each probe absorbs and emits light under conditions that mimic the intracellular environment. Biological testing, including MTT cell viability assays, is also in progress to determine the feasibility of these probes for use in living systems. This work makes progress towards a simple, low-cost fluorescence diagnostic tool for cancer detection.

Presenter: Layali Abusaleh [$]

Major: Chemical Engineering (Texas Academy)

Email: labusaleh@lamar.edu

Mentor: **Dr. Sylvestre Twagirayezu** [#]

[$] Dan F. Smith Department of Chemical and Biomolecular Engineering, Lamar University

[#] Department of Chemistry and Biochemistry, Lamar University

UG-S / In-Progress
U.R.G. Project
P1 – T#3

Temperature-Dependent Analysis of Petroleum Mixtures by Molecular Rotational Resonance Spectroscopy.

This project builds upon preliminary results obtained during a Summer Undergraduate Research Fellowship (SURF), where initial Molecular Rotational Resonance (MRR) studies revealed temperature-dependent spectral changes and unidentified resonances in simplified fuel mixtures. The current study extends these efforts to higher temperatures and more complex systems to establish the first temperature-resolved MRR database for petroleum fuels. The focus is on small polar impurities, including oxygen-, nitrogen-, and sulfur-containing compounds, which constitute less than 10% of fuels but significantly impact combustion and emissions.

Rotational spectra of binary mixtures containing isooctane with ethanol or methanol were recorded at various pressures and temperatures using a K-band MRR spectrometer (18–26 GHz). At lower pressures, spectral peaks were sharper and more defined, while higher pressures resulted in pressure broadening due to increased molecular collisions, reducing spectral resolution. Heating the mixtures to 200 °C produced new peaks not observed at room temperature, suggesting potential structural rearrangements, transient complex formation, or partial decomposition of components.

These results demonstrate MRR's sensitivity to intermolecular interactions, thermal effects, and collisional (pressure-induced) broadening in complex fuel mixtures. Future work will involve analyzing how temperature influences MRR signatures. This research will provide foundational data for molecular-level diagnostics in petroleum processing.

UG-S / In-Progress
Welch foundation
P1 – T#4

Presenter: Xin Chang [$]
Major: Physical Chemistry
Email: xin.chang@austin.utexas.edu
Mentor: **Dr. Wennie Wang** [$]
[$] McKetta Department of Chemical Engineering, The University of Texas at Austin, and Texas Materials Institute, The University of Texas at Austin, TX

Chirality induced spin selectivity (CISS) in donor-acceptor(DA) cocrystals: A spin-adapted approach.

Chirality-induced spin selectivity (CISS) in donor–acceptor (DA) cocrystals provides a promising mechanism for controlling spin-dependent excited-state dynamics in organic materials. To clarify the microscopic origin of triplet generation and its enhancement in chiral systems, we develop a spin-adapted vibronic Hamiltonian that incorporates Frenkel exciton and charge-transfer (CT) states, together with vibronic progression described within a shifted harmonic oscillator framework. Our model shows that the nonzero triplet yield observed in achiral DA cocrystals can already be understood from an α/βorbital energy offset in the CT manifold, which lifts the degeneracy of opposite-spin CT configurations and introduces singlet–triplet mixing. Building on this baseline mechanism, we further demonstrate that chiral side chains induce asymmetry in the electron and hole transfer integrals (t_e ┤ and ├ t_h), thereby breaking electron–hole symmetry and enhancing triplet formation beyond the achiral limit. This additional t_e/t_hasymmetry provides a simple and intuitive picture for the experimentally observed increase in triplet yield in chiral cocrystals. The calculated spectra and state characters consistently connect CT-state spin splitting, vibronic structure, and chirality-induced transfer asymmetry. These results provide a unified theoretical framework for understanding CISS-driven excited-state processes and for guiding the design of chiral organic materials with tunable spin-selective photophysics.

Presenter: **Yingjie (Jackie) Gao** [$]
Major: Chemical Engineering
Email: ygao3@lamar.edu
Mentor: **Dr. Sidney Lin** [#]
[$] Dan F. Smith Department of Chemical and Biomolecular Engineering,
Lamar University

UG-S / In-Progress
U.R.G. Project
P1 – T#5

High-resolution Simulation of Energy Storage by Microencapsulated Phase Change Material.

To reduce energy expenditure on industrial heating and the environmental impact caused by heat pollution, recapturing high or medium quality waste heat (~400 °C) can be achieved using Phase Change Material, which can repeatedly absorb and release a large amount of latent heat during solid-liquid phase change (melting and solidification). The goal of this research project is to develop a 3-D high-resolution mathematical model to study the effect of particle size on the rate and density of heat absorption by Micro-Encapsulated Phase Change Material (MCPCM), and to investigate the detailed thermal behavior that is difficult to obtain empirically. The model is developed based on the finite element analysis (FEA) technique using a commercially available simulation software, COMSOL Multiphysics. Unsteady state convection and conduction heat transfers and temperature-dependent thermal and transport variables are applied in this model. The melting is simulated by spreading out the latent heat into heat capacity at the melting point. Both packed bed and fluidized bed were used to recharge/discharge the stored thermal energy. Due to the small particle size and slow fluid flow (Re<1) the flowing fluid is considered to be a creeping flow. The time-depend local convective heat transfer coefficient between MCPCM outer surface and fluid is estimated from the local Nusselt number. The calculated time-dependent 3-D temperature history and profile results will be presented.

Presenter: **Sneha Jobby** [$]
Major: Biology
Email: sjobby@lamar.edu
Mentor: **Dr. Ashwini Kucknoor** [$]
Co-author: Camren Dionne
[$] Department of Biology, Lamar University

UG-S / In-Progress
U.R.G. Project
P1 – T#6

Role of Modulating Leishmania Amazonensis Infectivity in Macrophages.

Leishmania species are the causative agent of leishmaniasis, a tropical disease that poses a significant public health threat due to its high mortality in untreated cases, asymptomatic transmission, and rising drug resistance. The parasite establishes infection by evading host immune responses and inactivating macrophages, creating a permissive environment for survival within these macrophages. While host long non-coding RNAs (lncRNAs) are emerging as critical immune regulators, specific roles in Leishmania infection remain largely unexplored. The aim of this project is to elucidate the functional role of two differentially regulated lncRNAs, lnc-CMPK2-2 and lnc-TMEM121-26, in modulating macrophage permissiveness to the parasite. Using an in vitro model of human macrophage cell lines (U937), we first characterized the expression dynamics of these lncRNAs following Leishmania infection via RT-qPCR. Next, antisense oligonucleotides (ASO)s were used to knock down the lncRNA expressions to study their functional impact on infection outcomes, quantifying changes in parasite burden. To deliver the ASOs into the macrophages, a lipid-based transfection system was used. Standardization of transfection was carried out by using fluorescent-labeled control ASOs. The concentrations of ASOs to target lnc-CMPK2-2 and TMEM121-26 are currently being standardized to find the optimum concentration to achieve knockdown of the targets. Expected outcomes of this project are to verify the role of lnc-CMPK2-2 and lnc-TMEM121-26 during infection, demonstrating their causal role in macrophage permissiveness, and identifying the underlying molecular mechanisms. This research will advance fundamental understanding of Leishmania pathogenesis and has the potential to identify innovative host-directed therapeutic targets to combat this disease.

P1 – T#8 Special Talk : **The David J. Beck Fellowship: From Idea to Interview** with the 2026-27 Beck fellows: **Sneha Jobby, Isabella Tran, and Homero Tijerina**

The David J. Beck Fellowship: From Idea to Interview *follows the journey of three students, Sneha Jobby, Homero Tijerina, and Isabella Tran, and their experiences applying for the David J. Beck Fellowship, Lamar University's largest and most prestigious student award, which awards a full academic scholarship and up to $10,000 in funding for a summer project. The students will reflect on and walk through each stage of the application process, from identifying potential host institutions to building meaningful connections with project mentors. Information regarding the realities of drafting project proposals, securing letters of recommendation, and managing technical details will be discussed. Through sharing their experiences and insights, Sneha, Homero, and Isabella aim to inspire other students to consider applying for the David J. Beck Fellowship.*

Presenter: Mohamed Irhabi [$]
Major: Biology
Email: mirhabi@lamar.edu
Mentors: **Dr. Ioannis Petropolous** [#] **and Dr. Ashwini Kucknoor** [$]
[$] Department of Biology, Lamar University
[#] Division of Research in Medicine, Weill Cornell Medicine - Qatar

UG-S / Advanced
Beck Project
P1 – T#8

The Eye as a Window to the Brain: Advancing Neurovascular Disease Detection through Retinal and Corneal Imaging.

Introduction/Background: Cerebral small vessel disease (SVD) drives ischemic stroke, cognitive decline, and disability, yet early detection is limited by the sensitivity and availability of conventional neuroimaging. Because the retina is an extension of the central nervous system, its microvasculature may mirror cerebral pathology. Optical coherence tomography angiography (OCTA) provides rapid, noninvasive maps of retinal capillary networks. We hypothesize that OCTA metrics reflect MRI-defined SVD burden and functional status after stroke.

Prospective observational study of adults with recent ischemic stroke at Weill Cornell Medicine–Qatar (WCM-Q). *Exclusions*: ocular disease affecting microvasculature or poor image quality. OCTA will quantify vessel density, perfusion density, foveal avascular zone area, and choriocapillaris flow deficits in superficial and deep plexuses. Brain MRI will index SVD by STRIVE features (white matter hyperintensity volume, lacunes, microbleeds, enlarged perivascular spaces). Clinical measures: NIH Stroke Scale, modified Rankin Scale, and Montreal Cognitive Assessment. Multivariable regression and receiver-operating-characteristic analyses will test associations and discriminative ability while adjusting for age, sex, and vascular risk factors.

Primary outcome: correlation between OCTA metrics and composite MRI SVD burden. Secondary outcomes: relationships with disability and cognition, plus feasibility metrics (recruitment rates, scan quality). Interim analysis will be presented if available at the time of the meeting.

If retinal microvascular alterations measured by OCTA track cerebral SVD and clinical outcomes, OCTA could serve as a low-burden, non-contrast biomarker to complement MRI for early detection and longitudinal monitoring. Anticipated limitations include cross-sectional design for initial analyses, ocular comorbidities, and generalizability. Future work will evaluate longitudinal prognostic value, standardize acquisition/analysis pipelines, and explore integration with routine stroke follow-up.

BS_1 – Fundamental Research – Undergraduate Session

Location: Sabine 1

Chair: Dr. Zhaozhong Shi

Presenter: **Alysa Patteson** [$]
Major: Physics
Email: alysapatteson@gmail.com
Mentor: **Dr. Zhaozhong Shi** [$]
[$] Department of Physics, Lamar University

UG-S / In-Progress
United States Department of Energy NuSTEAM grant
BS_1 – T#1

Analytical Calculations for the Far Backward Pair Spectrometer Luminosity Monitor for ePIC.

The Lamar University NuSTEAM team is working in collaboration with the University of Houston and Brookhaven National Laboratory to design, model, and build the luminosity monitor for the far backward pair spectrometer subsystem of the ePIC detector at the Electron-Ion Collider. The goal is to explore design options and provide precision measurements of collision luminosity. The luminosity monitor tracks the flux of photons that undergo electron-positron pair production. These resulting pairs are separated in a magnetic dipole and detected by electromagnetic calorimeters arrays.

The work for this project focuses on analytical calculations used to model the trajectory of the particles through the magnetic field and maximize calorimeter acceptance. Expressions derived for particle position were used to determine the constraints required for particles to reach the calorimeters, along with the corresponding momentum and angular acceptance ranges. An analysis program was developed to extract particle kinematics from simulation outputs. Results from the analytical calculations were compared with data obtained from running full ePIC simulations in C++ using ROOT and GEANT.

Initial comparisons between the calculated momentum range and the simulation results showed discrepancies. To investigate this, simulations were performed with the magnetic field turned off, allowing an electron beam to travel through the detector in a straight path. This study revealed two additional constraints, one within the magnetic field region and another above it. We will incorporate the realistic material structure and geometric dimensions of the analyzer magnet, introducing additional constraints affecting the particle trajectories and accepted momentum range.

Presenter: Kenneth Bibb [$]
Major: **Physics**
Email: kbibb@lamar.edu
Mentor: **Dr. Zhaozhong Shi** [$]
[$] Department of Physics, Lamar University

UG-S / In-progress
Faculty Research Grant
Jefferson Laboratory
BS_1 – T#2

Study of ω(782) Meson Production Using CLAS12 Data.

Exclusive ω(782) vector meson electroproduction (e p → e′p′ω) is crucial for studying emergent phenomena of the strong interaction as described by Quantum Chromodynamics (QCD). These measurements are essential for understanding the role of quark and gluon dynamics in the nucleon. This analysis uses data collected with the Continuous Electron Beam Accelerator Facility (CEBAF) and the Large Acceptance Spectrometer for 12 GeV electrons (CLAS12) in Hall B at the Thomas Jefferson National Accelerator Facility, a state-of-the-art experimental setup for nuclear and hadronic physics in Newport News, Virginia. We analyze existing CLAS12 data to study ω meson production through cross-section measurements across a broad kinematic range. Signal yields are extracted using Proton Missing Mass (PMM) and Omega Meson Mass (OMM) techniques. Two exclusive decay channels are considered: $\omega \rightarrow \pi^+\pi^-\pi^0$ and $\omega \rightarrow \pi^0\gamma$. The analysis is performed in bins of momentum transfer t and virtual photon virtuality Q^2, incorporating decay topology and cut-based event selection to improve signal-to-background separation. These results provide input to future measurements of ω meson production and related observables. Future work will explore machine learning and deep learning approaches to further enhance event selection

Presenter: Alan Briseno [$]
Major: **Astrophysics**
Email: alanbriseno50@gmail.com
Mentor: **Dr. Billy Quarles** [$]
[$] Department of Physics and Astrophysics, East Texas A&M University, Commerce, TX

UG-S / In-progress
Faculty Research Grant
BS_1 – T#3

Tidal Evolution of packed moon systems around an Earth-mass planet.

Over 1000 moons are known to orbit planets and dwarf planets in the Solar System. The majority orbit gas giants in the outer Solar System, while only three orbit terrestrial planets: Earth (Luna) and Mars (Phobos & Deimos). Here, we investigate the stability limits of an Earth-mass planet hosting multiple moons with gravitational and tidal forces included. We evaluate various scenarios using the REBOUND N-body integrator with the tides spin module in REBOUNDx, running thousands of simulations to assess the stability of tightly packed systems of Luna, Pluto, and Ceres-mass moons across a range of tidal dissipation parameters up to 10 million dynamical orbits of the innermost moon. We find that an Earth-mass planet can stably host up to two Luna-mass moons, three Pluto-mass moons, or five Ceres-mass moons, depending on tidal conditions. Under Earth-like dissipation, the Luna, Pluto, and Ceres packed systems achieve long-term stability only within narrow regions of orbital spacing. These results imply that long-lived multi-moon systems around Earth-mass planets are possible but strongly depend on tidal dissipation. If such conditions arise, tides affecting oceans likely must be weaker than those produced by the present-day Earth-Moon system.

**This work used the Launch cluster at Texas A&M High Performance Research Computing (HPRC) through allocation PHY240337 from the Advanced Cyberinfrastructure Coordination Ecosystem: Services & Support (ACCESS) program, which is supported by U.S. National Science Foundation grants #2138259, #2138286, #2138307, #2137603, and #2138296. This work was also supported by the Texas A&M High Performance Research Computing (HPRC) facility through computing resources on the Launch cluster. The Launch cluster was funded by the National Science Foundation Campus Cyberinfrastructure (CC*) program under grant No. 2232895*.

Presenter: **Christopher Ezike** [$]
Major: **Physics**
Email: cezike1@lamar.edu
Mentor: **Dr. Zhaozhong Shi** [$]
Co-author: Dr. Philip Cole [#]
[$] Department of Psychology, Lamar University
[#] Midstream Management & Science, Lamar University

UG-S / Advanced
Faculty Research Grant
Brookhaven National Laboratory
BS_1 – T#4

Systematic Scan of the ePIC LumiDirectPCAL Pair Spectrometer Luminosity Detector Using Geant4-Based Simulations (DD4hep / ddsim).

In coordination and collaboration with the University of Houston and York University, the Lamar NuSTEAM team will help design, model, build, and calibrate the luminosity monitor for EPIC. Accurate and precise knowledge of luminosity is essential for extracting correct cross sections, making the proposed monitor a critical component for all EPIC work. The monitor is based upon the Bethe-Heitler process $e^-p \rightarrow e^-\gamma p$. The bremsstrahlung photon impinges upon a converter and pair produces, i.e. $\gamma \rightarrow e^-e^+$. The resulting nearly collinear e^-e^+ pair enters a magnetic dipole field, causing the oppositely charged leptons to separate through oppositely curved trajectories. Upon exiting the field, each lepton follows a straight-line path onto highly segmented stacked ECAL arrays for energy measurement. The ECAL design is predicated upon the Beam Pipe Calorimeter detailed in an unpublished thesis from Prof. Bernd Surrow (DESY, 1998).We will present the methodology behind mapping calorimeter acceptance as a function of $E\gamma$. Simulations were used to adjust magnetic field configurations to optimize acceptance of the pair-produced leptons, enabling accurate reconstruction of the parent bremsstrahlung photon's energy and directly measuring the pair-production rate for precisely ascertaining the EIC electron beam flux. A systematic scan of the ePIC LumiDirectPCAL detector geometry was performed using full Geant4-based simulations within the DD4hep framework via ddsim, mapping ECAL acceptance across varying field settings to identify configurations that maximize pair separation and minimize systematic uncertainties.

Presenter: **Peggy Bryan** [$]
Major: Biology
Email: pbryan1@lamar.edu
Mentor: **Dr. Matt Hoch** [$]
Co-authors: Alysha Heredia and Riley Trent [$]
[$] Department of Biology, Lamar University

UG-S / In-Progress
BS_1 – T#5

The Southeast Texas Ameriflux Study of Methane emissions and mechanism.

Methane (CH_4) is a potent greenhouse gas with a global warming potential significantly greater than carbon dioxide over short timescales, and wetlands are responsible for approximately 20–30% of annual global CH_4 emissions. Understanding CH_4 dynamics in coastal systems is critical, particularly in salt marshes where emissions are highly variable due to salinity gradients, tidal fluctuations, and changes in marsh health associated with relative sea level rise. These environmental factors can strongly influence both the production and release of methane, making salt marshes complex but important systems to study. In this study, CH_4 emissions are being investigated in a Texas coastal marsh located in Jefferson County, TX, with a focus on comparing low-elevation sites experiencing vegetation dieback to sites where elevation has been restored using dredged material from nearby shipping channels. This comparison allows for evaluation of how marsh restoration and elevation influence greenhouse gas fluxes. The Southeast Texas Ameriflux study uses an eddy covariance approach to continuously monitor both CO_2 and CH_4 fluxes between the marsh surface and atmosphere, providing high-frequency, ecosystem-scale measurements of gas exchange. These data are complemented by static chamber measurements that isolate and quantify diffusion and ebullition as the primary mechanisms of CH_4 release. Together, these methods provide a more comprehensive understanding of CH_4 emission pathways and variability. The resulting data will be interpreted in the context of tide level, meteorological conditions, water quality, and overall marsh condition to better identify the key environmental controls on CH_4 emissions in coastal marsh ecosystems of southeast Texas.

BS_2 – Fundamental Research – Graduate Session

Location: Live Oak Ballroom & Zoom Streamed

Chair: Dr. Gengiz Sen

Presenter: **Ana Paula Pereira Guimaraez** [$]

GR-S / In-Progress

Major: Biomedical Sciences - Research technician
Email: anpereir@utmb.edu
Mentor: **Dr. Ramkumar Menon** $
Co-authors: Italo R. Calori, Ananth K. Kammala, Lauren S. Richardson, and Ramkumar Menon $
$ Division of Basic Science and Translational Research, Department of Obstetrics and Gynecology, UTMB, Galveston, TX

Faculty Research Grant
BS_2 – T#1

Development and Characterization of 3D Placenta and Fetal Membrane-Derived Spheroids to Model Both Fetal–Maternal Interfaces.

Three-dimensional (3D) spheroid models are New Approach Methodologies (NAMs) to recapitulate the complex cell–cell and cell-extracellular matrix interactions found in vivo. NAMs are critical for pregnancy research as animal models do not reproduce human feto-maternal interfaces (FMi; placenta-decidua and fetal membrane-decidua). Here, we established a physiologically relevant 3D model of the trophoblast portion of the FMi to investigate pathologies associated with adverse pregnancy outcomes. Chorion trophoblast cells (CTCs) and placental trophoblast cells (PTCs) are isolated and immortalized from human term, not in labor, placental and fetal membrane tissue and used to form spheroids using the hanging drop method. Viability and morphology were quantified by CellTiter-Glo® 3D, LIVE/DEAD® staining, and ImageJ-based analysis of brightfield images. Phenotypic profiling was performed by confocal immunofluorescence, and secreted cytokines and hormones were quantified by multiplex and ELISA. Optimal spheroid formation was obtained with 50 cells and 5 µg/mL collagen I for both cell types. Under these conditions, CTC and PTC spheroids showed progressive growth and remained viable for up to 21 days. CTCs spheroids expressed essential chorionic immune regulatory features HLA-G and PGRMC1. PTCs expressed canonical cytotrophoblast markers GATA3, became GCM1 positive with increased β-hCG production by day 21, documenting syncytialization. CTC and PTC spheroids produced basal levels of cytokines IL-6, IL-8, and TNF, hormones prolactin, β-hCG, progesterone,VEGF-A and PlGF. PTC spheroids exhibited marked increases in endocrine markers β-hCG, VEGF-A, PlGF, and progesterone by day 21, consistent with late-stage maturation. Here, we have developed three spheroid models of trophoblasts, the chorion of the fetal membrane, and cyto- or syncytiotrophoblasts of the placenta, as NAMs that can be used in high-throughput to study FMi biology and mechanisms associated with adverse pregnancy outcomes.

Presenter: **Ange Benise Niyikiza** $
Major: Physics
Email: baniyiki@cougarnet.uh.edu
Mentor: **Dr. Zhifeng Ren** $
Co-author: Peng Ying $
$ Department of Physics and Texas Center for Superconductivity at the University of Houston, Houston, TX

GR-S / In-Progress
Faculty Research Grant
BS_2 – T#2

Synthesis and Characterizations of Boron Arsenide Crystals.

Due to its ultrahigh thermal conductivity, boron arsenide (BAs) has attracted significant attention in both theoretical and experimental research. Compared to diamond, the bulk material with the highest

isotropic thermal conductivity, BAs offers additional advantages, including a suitable bandgap (1.8~2.0 eV), high ambipolar mobility, and a thermal expansion coefficient compatible with commonly used semiconductors. These properties make BAs a promising candidate for high-power electronic applications. However, the challenge of growing BAs single crystals with minimal defects remains. In this study, we focus on synthesizing high-quality BAs single crystals using an improved chemical vapor transport method and evaluating the effectiveness of this approach for crystal growth. We also provide a brief overview of the characterization techniques employed in this work.

Presenter: **Sudaice Kazibwe** [$]
Major: Physics
Email: skazibwe@cougarnet.uh.edu
Mentor: **Dr. Liangzi Deng** [$]
Co-authors: Thacien Habamahoro, Stephen Davis, and Ching-Wu Chu [$]
[$] Department of Physics and Texas Center for Superconductivity at the University of Houston, Houston, TX

GR-S / In-Progress
Faculty Research Grant
BS_2 – T#3

Mapping the Superconducting T_c – P Phase Diagram of Cuprates to the Megabar Regime.

Following the discovery of YBa2Cu3O7-δ (YBCO) by C. W. Chu's group at UH and collaborators with a superconducting critical temperature (Tc) of 93 K at ambient pressure, the first high Tc superconductor without any rare-earth element, Bi2Sr2Ca2Cu3O10+δ (Bi-2223), was discovered by Maeda et al. in 1988. However, the reported samples were multiphase, containing both Bi-2223 and Bi-2212, motivating extensive efforts to achieve phase-pure Bi-2223. One commonly explored strategy involves partial substitution of lead at the bismuth site. In this talk, I will discuss the synthesis of nearly phase-pure Bi-2223. Given that pressure can tune crystal structures, the density of states at the Fermi level, and other key parameters, it can significantly influence superconductivity. Hemley's group reported a second superconducting dome in Bi-2223 through magnetization measurements with a record Tc of ~ 190 K at 60 GPa at the 2026 APS Global Meeting. We revisited the pressure effects on the superconducting properties of Bi-2223 up to ~ 60 GPa, contrary to previous reports of a Tc resurgence, we discovered a complete suppression of superconductivity across all experiments conducted using different pressure transmitting media. We have observed a similar phenomenon in single crystals of Hg1223 where the superconducting state is suppressed at ~ 90 GPa. This raises an important question about the nature of the magnetic transitions associated with the reported Tc resurgence. By mapping out the phase diagram for these two systems, it gives an opportunity to study the possible existence of exotic phases competing with superconductivity.

Presenter: **Isha Sunil Kapte** [$]
Major: Physics
Email: ixk230003@utdallas.edu
Mentor: **Dr. Jason Slinker** [$,#]
Co-author: Anusha Srivastava [#]
[$] Department of Physics, University of Texas at Dallas, TX
[#] Department of Materials Science and Engineering, University of Texas at Dallas, TX

GR-S / In-Progress
NSF DMR Grant
BS_2 – T#4

Optimizing Blue Perovskite LEDs via Dual-Ligand Assisted Quasi-2D Layering.

A highly efficient blue quasi-2D perovskite light-emitting diode (PeLED) is developed using a dual-ligand composition in a CsPbBr3 perovskite film. By incorporating ethane-1,2-diammonium bromide ($EDBr_2$) and methylphenylammonium chloride (MeCl), it forms isolated 2D perovskite layers and enhances charge transfer between these layers that minimizes nonradiative recombination. The PeLED displays a peak emission that is characteristically blueshifted from ~520 nm for unmodified pristine CsPbBr3 films to 490 nm for the quasi-2D structured films. The addition of $EDBr_2$ stabilizes the perovskite structure, leading to better energy alignment, reducing defects and enhances the formation of Dion-Jacobson phases as evidenced by UV-Vis absorption, photoluminescence, and electroluminesce characterization studies. Comprehensive analyses show that this method is pivotal in achieving both high efficiency and long-term operational stability for blue PeLEDs.

Reference: M. Alahbakhshi, A. Mishra, G. Verkhogliadov, E. E. Turner, R. Haroldson, A. C. Adams, Q. Gu, J. J. Rack, J. D. Slinker, and A. A. Zakhidov. Highly Efficient Quasi 2D Blue Perovskite Electroluminescence Leveraging a Dual Ligand Composition. *Adv. Funct. Mater*. **33**, 2214315 (2023).

Presenter: **Anusha Srivastava** [$]
Major: Materials Science and Engineering
Email: axs200001@utdallas.edu
Mentor: **Dr. Anvar Zakhidov** [$,#]
Co-author: Isha Sunil Kapte [#], Matthew Lochridge [#], and Jason Slinker [#]
[$] Department of Materials Science and Engineering, University of Texas at Dallas, TX
[#] Department of Physics, University of Texas at Dallas, TX

GR-S / In-Progress
NSF DMR Grant
BS_2 – T#4

Enhancing Quasi-2D Perovskite LEDs via Quantum Dot Integration for Brighter and More Stable Emission.

Metal halide perovskite quantum dots (QDs) have drawn immense interest for LEDs due to their narrow emission, high photoluminescence quantum yield, and color tunability. Yet, blue quasi-2D perovskite LEDs (PLEDs) remain limited by low brightness and modest external quantum efficiency (EQE). Here, we employ solvent engineering to incorporate FA-doped $CsPbBr_{1.5}Cl_{1.5}$ QDs into quasi-2D emissive layers to enhance luminescence and film quality. As a proof of concept, we integrated $CsPbBr_3$ QDs into 3D $CsPbBr_3$ films for single-layer perovskite light-emitting electrochemical cells (PeLECs), achieving luminance improvements from only 1200 cd/m² for 3D only to over 3000 cd/m² for 323D+QDs nanocomposite. Blue PQD incorporation improves radiative recombination via stronger quantum confinement, reduces nonradiative losses by covering pinholes, and enables more uniform charge transport in continuous matrix. This approach points toward brighter, more stable, and color-tunable perovskite LECs, while providing design insights for advancing blue quasi-2D PLEDs and PLECs.

References:

1. Mishra, A., Bose, R., Zheng, Y., Xu, W., McMullen, R., Mehta, A. B., Kim, M. J., Hsu,J. W., Malko, A. V., & Slinker, J. D. (2022). Stable and bright electroluminescentdevices utilizing emissive 0D perovskite nanocrystals incorporated in a 3D CSPBBR3matrix. Advanced Materials, 34(31). https://doi.org/10.1002/adma.2022032262.

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Presenter: **Iqra Zahid** [$]
Major: Physics
Email: izahid2@uh.edu
Mentor: **Dr. Paul C.W.Chu** [$]
Co-authors: Liangzi Deng [#] , Wei-Lee [$,#] , and Akhilesh Singh [#]
[$] College of Natural Science and Mathematics(NSM) at the University of Houston, Houston, TX
[#] Institute of Physics, Academia Sinica, Taipei Taiwan

GR-S / In-Progress
Faculty Research Grant
BS_2 – T#6

Study of Pressure Effect on Strain-Induced Superconductivity in RuO_2 Thin Films on TiO_2 (110) substrate.

At ambient pressure, epitaxial RuO_2 films grown on TiO_2 (110) with thicknesses of 20 nm and 30 nm show superconducting transitions with Tc = 2.33 K and Tc = 2.16 K, respectively. The slightly lower Tc in the thicker (30 nm) film is consistent with partial strain relaxation: as RuO_2 films become thicker, the lattice approaches its bulk parameters and the strain-driven orbital rearrangements that favor superconductivity are weakened. The relatively sharp transitions in both films indicate that the high quality of the thin film and confirm that epitaxial strain on TiO_2 (110) is an effective route to stabilize superconductivity in RuO_2. High-pressure transport measurements were performed using an in-house BeCu clamp cell. Applying hydrostatic pressure up to 2.2 GPa suppresses Tc in both films, yet superconductivity persists throughout the entire pressure range. After releasing the pressure, Tc returns to its original value, demonstrating that the pressure effect is fully reversible. Our results reveal that the strain-induced superconducting state in RuO_2 is robust and tunable via application of pressure without introducing disorder and inhomogeneity. Pressure counteracts the anisotropic strain that created the superconducting state. The fact that Tc decreases smoothly and recovers fully on decompression indicates that no plastic deformation occurs in this pressure window. In the 20 nm film, the room-temperature resistance drops sharply once the pressure exceeds ~ 0.5 GPa, whereas in the 30 nm film the resistance increases abruptly in a similar pressure range. The observed opposite R300K (P) trend for two films grown on the same substrate worth further investigation to understand the underlying mechanism. The above findings highlight a delicate but controllable interplay between epitaxial strain and hydrostatic pressure in rutile RuO_2 and suggest that combining these two knobs is a promising strategy to probe the pairing mechanism and to optimize superconducting properties in ruthenate-based heterostructures.

Presenter: **Huma Nawaz** [$]
Major: Physics
Email: hnawaz@cougarnet.uh.edu
Mentor: **Dr. Chi Sen Ting** [$]
Co-authors: Dawei Wang [$] and Laurent Bellaiche [#]
[$] Department of Physics and Texas Center for Superconductivity at the University of Houston, Houston, TX

GR-S / In-Progress
Faculty Research Grant
BS_2 – T#7

Smart Ferroic Materials Center, Department of Physics and Institute for Nanoscience and Engineering, University of Arkansas, Fayetteville, AK

Computational tools to study superconducting materials and career after PhD.

I will walk the audience through different areas of research in theoretical Condensed Matter Physics, courses to prepare for it in graduate and undergraduate and how to leverage the computational tools (including AI, Python, Quantum Espresso etc.) for a comprehensive study of materials before they are tested in the laboratories. We have calculated the transition temperature of superlattices using first principles calculations. The resulting temperature was seen to increase due to an insulating layer of atoms. It has applications in superconductivity, Josephson junctions and quantum computing. In the end I will briefly discuss career choices after PhD in Condensed matter Physics.

BS_3 – Applicative Research – Graduate Session

Location: Neches 120

Chair: Dr. Robert Kelley Bradley

Presenter: **Dipongkar Ray Sobuj** [$]
Major: Chemistry
Email: dsobuj@lamar.edu
Mentor: **Dr. Paul Bernazzani** [$]
[$] Department of Chemistry and Biochemistry, Lamar University

GR-S / Advanced
Welch Foundation
BS_3 – T#1

Development of a Stable Phospholipid-Lipid Complex for Controlled Drug Release Applications.

Drug delivery systems are designed to increase the steady bioavailability of hydrophobic or semi-hydrophobic drugs. Such application is determined by the properties of the material which are ultimately related to the chemical structure. We aim to develop a highly stable phospholipid lipid-based delivery systems by controlling interactions between phosphatidylcholine, and cholesterol and tried to incorporate hydrocortisone into it as a model drug. The purity of the individual components and the intermolecular interactions and chemical compatibility of composite mixture of phosphatidylcholine, cholesterol and hydrocortisone was determined by the Fourier Transform Infrared Spectroscopy (FTIR). The thermal stability of the systems was evaluated using differential scanning calorimetry. Variations in the transition temperatures and enthalpy changes as the amounts of binding agents increased suggested that the structure of the material underwent changes. These changes were confirmed by the appearance of phospholipids fibers and evaluated on Optical Microscopy. Finally, the Kinetics of drug was determined by Fourier Transform Infrared Spectroscopy (FTIR)to see the controlled release of the drug.

Presenter: **Mohsina Binte Rahman** $
Major: Management Information Systems (MIS)
Email: mrahman79@lamar.edu
Mentor: **Dr. Ashraf El-Houbi** $
Co-author: Razia Sultana (Borna)
$ Department of Information Systems, Lamar University

GR-S / In-progress
Excellence in Assessment
BS_3 – T#2 Grant

Macroeconomic Determinants of Unemployment in Southeast Texas: Evidence from an ARDL Cointegration Analysis.

In this study, it has been intended to investigate the determinants of unemployment at Southeast Texas over the period 1960–2025.Using long-term time-series data, the factors are identified in macroeconomic context. Secondary data collected from the U.S. Bureau of Labor Statistics (BLS) and foreign direct investment (FDI) has been used in this study. As most of the existing research examines unemployment using static regression and correlation, it may mislead the inferences due to non-stationary economic variables. Addressing the limitations and challenges of existing research studies and data availability about labor market, this study applied the Autoregressive Distributed Lag (ARDL) bounds testing methodology to differentiate between short-run fluctuations and long-run equilibrium relationships among all the variables, such as unemployment, level of education, growth of population, inflation, and economic growth. Additionally, unit root tests present a verity of order for integrating variables, validating the approach of the using the ARDL.

The observation of this study is that the existing policies mainly focused only on short-term demand stimulus, which are not sufficient to address the long-term unemployment problem. Instead, the findings of the study suggest that sustainable investment in human capital development and Collaborative macroeconomic stabilization strategies is necessary to improve labor market performance and mitigate unemployment crisis. The results provide empirical guidelines for policymakers, regional planners, and business stakeholders in designing evidence-based employment strategies tailored to regional economic conditions.

Presenter: **Suraj Jadhav** $
Major: Industrial Engineering
Email: sjadhav5@lamar.edu
Mentor: **Dr. Robert Kelley Bradley** $
$ Department of Industrial and Systems Engineering, Lamar University

GR-S / In-progress
Departmental Research
BS_3 – T#3

Repeatable Electron-Beam-Induced Actuation of Microstructures.

Two-photon stereolithography (TPS) is an advanced additive manufacturing technique that creates intricate 3D micro-structures which are made up of a dielectric material. These dielectric structures can be actuated using a scanning electron microscope (SEM) beam. The focused electron beam interacts with

the material, inducing localized charging and electrostatic forces. By adjusting the SEM's current, and scanning pattern, a mechanical motion can be achieved. SEM-based actuation enables real-time imaging and feedback, enhancing control. Common challenges are preventing beam-induced damage and ensuring repeatable motion. It has been observed that we can control the direction of the motion of a structure if we follow a specific pattern to focus the beam on the structure. The amount of motion depends on how long the beam is focused. However, it has also been observed that the motion decreases as the number of cycles increases. Attempts are being made to find a pattern between the dimensions of a structure, the current being discharged by the structures, and the amount of motion. A goal has been established that we should get the motion that will be within a range that was predicted beforehand for the structures with the same shape and dimensions. This will enable us to create a customized microstructure which can do some simple tasks. This synergy of TPS fabrication and SEM actuation paves the way for the next generation of programmable micromechanical systems.

Presenter: **Abdulhafeez Bello** [$]
Major: Industrial Engineering
Email: abello3@lamar.edu
Mentor: **Dr. Robert Kelley Bradley** [$]
[$] Department of Industrial and Systems Engineering, Lamar University

GR-S / In-progress
Departmental Research
BS_3 – T#4

Evaluation of LDPE Pads as Support Materials in Steel Pipeline Systems.

Corrosion damage at pipeline supports pose significant economic, environmental, and integrity concerns. This research aims to investigate the feasibility of using low-density polyethylene (LDPE) as a material for steel pipeline support pads. The objectives of this research are to design and fabricate LDPE pads that minimize atmospheric moisture buildup and assess their mechanical performance under various loading conditions. It is expected that the use of LDPE pads will provide corrosion resistance and mechanical performance like existing high-cost pads, but with greater cost-effectiveness, ultimately contributing to the development of improved pipeline support systems. This research has the potential to reduce the economic and environmental costs associated with corrosion damage, and its outcomes will inform the design and implementation of more sustainable pipeline support solutions.

Presenter: **Md Murad Sharif** [$]
Major: Computer Science
Email: msharif2@lamar.edu
Mentor: **Dr. Md Rakibul Islam** [$]
Co-authors: Mohammad Anisur Rahman [#] and Sharmistha Chowdhury [#]
[$] Department of Computer Science, Lamar University
[$] Department of English and Modern Languages, Lamar University

GR-S / In-progress
Excellence in Assessment Grant
BS_3 – T#5

AutoGrader: Automatic Grading and Feedback System in the Context of Lamar University.

Timely, consistent grading feedback is critical to student success, yet manual grading at scale remains a persistent challenge in higher education. This study evaluates three large language models—Llama 3.3 70B, Mistral Large 3, and Microsoft Co-Pilot—as automatic graders across 722 rubric evaluations from Technical Writing and Strategic Management courses at Lamar University. LLM-assigned scores were compared against faculty grades using exact-match rate, mean absolute error, and Pearson correlation, with statistical testing via Kruskal-Wallis and Mann-Whitney U tests. Co-Pilot achieved the strongest performance on English assignments ($r = 0.991$, 63.6% exact match) and received the highest faculty feedback quality ratings (98.7% Good or Excellent). All models struggled with Management rubrics, where exact-match rates fell to 18–45%. Statistically significant differences in accuracy were confirmed across models ($p = 0.011$). Findings indicate that LLMs can meaningfully support grading for structured rubrics, but human oversight remains essential for complex, discipline-specific assessments.

Presenter: **Kenechukwu Chikezie** [$]
Major: Chemistry and Biochemistry
Email: kchikezie@lamar.edu
Mentor: **Dr. Zhifo Guo** [$]
[$] Department of Chemistry and Biochemistry, Lamar University

GR-S / Advanced
Departmental Research
BS_3 – T#6

Development of a Stable Phospholipid-Lipid Complex for Controlled Drug Release Applications.

Toxic heavy metals such as mercury (Hg^{2+}) and copper (Cu^{2+}) pose serious risks to public health and environmental safety. Mercury is a potent neurotoxin that biomagnifies through aquatic food webs, causing irreversible neurological damage at trace exposure levels. Copper, though essential for biological function, becomes toxic when dysregulated and is associated with hepatic injury and neurological disorders such as Wilson's disease. Conventional detection methods, including atomic absorption spectroscopy and ICP-MS, require expensive instrumentation and long turnaround times, limiting their utility for rapid, on-site monitoring. These limitations are especially critical in Southeast Texas, where industrial waterways such as the Houston Ship Channel harbor dredged sediments known to contain mercury, copper, and other hazardous contaminants that can be redistributed into surrounding communities through dredging activities.

This study reports the design, synthesis, and characterization of a novel triphenylamine–Schiff base–thiourea hybrid fluorescent chemosensor (L) for the dual selective detection of Hg^{2+} and Cu^{2+}. Upon binding either ion, L exhibits rapid, concentration-dependent fluorescence quenching at 488 nm via a chelation-enhanced quenching (CHQ) mechanism. The sensor displays a fluorescence quantum yield of 0.45, strong association constants ($1.21 \times 10^6\ M^{-1}$ for Cu^{2+}; $2.03 \times 10^5\ M^{-1}$ for Hg^{2+}), confirmed 1:1 binding stoichiometry by Job's plot, and a detection limit of approximately 1.14 µM, validated in real environmental water samples. Selectivity was established against 18 competing metal ions. Critically, L distinguishes Hg^{2+} from Cu^{2+} through differential responses to competitive chelators: glutathione restores fluorescence in the Hg^{2+}-quenched system but not in the Cu^{2+}-quenched system. DFT calculations confirmed distinct binding modes, with HOMO–LUMO gap contractions of 0.71 eV for Cu^{2+} and 0.13 eV for Hg^{2+}. Live-cell fluorescence imaging in CL1, A549, and HeLa cell lines demonstrated good biocompatibility and reliable intracellular Cu^{2+} sensing. This work provides a low-cost, portable, and highly selective sensing platform with applications in drinking water monitoring, industrial effluent surveillance, and biomedical metal ion studies

P_2 – HASBSEB & STEM Plenary Session

Location: Live Oak Ballroom A&B

Chair: Dr. Yan Yan and Dr. Gina Hale

Presenter: Laci Graham [$]
Major: Interdisciplinary Studies (Early Childhood Education)
Email: lgraham12@lamar.edu
Mentor: **Dr. Yan Yan** [$]
[$] Department of Curriculum and Instruction, Lamar University

UG-H / In-progress
U.R.G. Project
P2 – T#1

Comparing Pre-Service and In Service Elementary Science Teacher experience with Using Chat GPT for Lesson Planning, Activity Designing, and Assessment.

This study aims to explore and compare the experiences of pre-service and in-service elementary science teachers in using ChatGPT as a tool for lesson planning, activity design, and assessment. As of now, artificial intelligence has intricately woven itself into various aspects of our society, and, more recently, the education field. As AI continues to evolve, its integration into our daily lives, careers, and education will become inevitable. Rather than resisting this rise of artificial intelligence, we should embrace it and explore its potential as a tool to support progress and developmemt everchanging society, particularly in the field of education. This research investigates how generative AI, ChatGPT supports creativity, efficiency, and confidence in lesson preparation for pre-service and in-service elementary science teachers while also determining possible challenges and ethical concerns that may arise from its use.

Data will be gathered through surveys and semi-structured interviews with pre-service teachers, currently enrolled in a teacher education program, and in-service teachers currently employed in an elementary school science classroom or who teach science in a self-contained classroom. This explorative-qualitative design allows for a nuanced analyzation of pre-service and in-service teachers' experiences, focusing on usefulness, ease of use, and pedagogical alignment of the AI generated content. Overall, the basis of this research is to provide insight into the use of ChatGPT as a learning enhancement tool that will benefit teachers and future teachers as they progress in their careers.

Presenter: Anas Saleh [$]
Major: Electrical Engineering
Email: asaleh@lamar.edu
Mentor: **Dr. Cagatay Tokgoz** [$]
[$] Phillip Drayer Department of Electrical and Computer Engineering, Lamar University

UG-H / In-progress
U.R.G. Project
P2 – T#2

Design and Simulation of a Phased Array Antenna for 5G Wireless Applications.

5G wireless systems provide faster speeds and lower latency for modern communication applications. However, these systems operate at high frequencies (20–300 GHz), which results in significant path loss, reduced coverage, and increased interference. To address this issue, antenna arrays are used to create steerable beams that focus energy in a specific direction, improving signal strength and communication reliability. This research begins with the design and optimization of a microstrip patch antenna using Altair FEKO electromagnetic simulation software. During the design process, key parameters such as patch width, patch length, and feed strip width were adjusted to achieve impedance matching close to 50 Ω at 28 GHz. The final design achieved a low reflection coefficient of approximately -35 dB, indicating minimal signal reflection and high efficiency. The optimized antenna satisfies the required performance criteria and is suitable for array implementation. Ongoing work involves integrating multiple antenna elements into an array to produce a focused and steerable beam with higher gain compared to a single antenna.

Presenter: Michael Vu [$]
Major: Finance/Human Resources Management
Email: mvu1@lamar.edu
Mentor: **Dr. Jamie Kurash** [$]
[$] School of Accounting, Finance, and Economics, Lamar University

UG-H / In-progress
U.R.G. Project
P2 – T#3

Can We Exploit Abnormal Stock Returns from Effective Date Delays?

Event studies are a traditional way to study whether a particular event has generated a significant change in typical stock behavior. This study examines the effect on the day that a 2020 Presidential Candidate had announced on their campaign that they would cancel the Keystone XL Pipeline. Parametric single-firm tests, as specified by MacKinlay (1997) and Wolf, Schimmer, Levchenko, & Müller (2014) showed statistically significant evidence to support the claim that this announcement affected the stock prices abnormally. However, the parametric cross-sectional test of Boehmer, Musumeci, and Poulsen (1991) and adjusted by Kolari & Pynnönen (2010) suggested that there was no statistically significant evidence to support the claim that the event influenced the energy industry. The study can be developed further using non-parametric tests, along with different event windows for both robustness and to potentially isolate the timing of the effect.

Presenter: **Shoniya Murphy** [$]
Major: Mechanical Engineering and Physics
Email: smurphy12@lamar.edu
Mentor: **Dr. Binod Nainabasti** [$]
Co-authors: Abigayle Welch [$]
[$] Department of Physics, Lamar University

UG-S / Advanced
U.R.G. Project
P2 – T#4

Analyzing complex physics concepts via performance and retention study.

Effective instructional design in introductory physics requires a deep understanding of long-term conceptual retention. The Preparatory Physics course at Lamar University is designed to strengthen students' mathematical and conceptual foundations so they are better prepared for success in introductory physics and engineering courses. In this study, we identified and examined concept-level retention patterns among approximately 300 students across three preparatory sections, comparing performance on Exams 1–3 to the cumulative final. To isolate conceptual growth, performance was analyzed by individual physics concepts rather than the total exam scores. The concept averages of Exams 1–3 were compared to the final exam. The results were then classified as either retained, degraded, or improved. Related ideas such as vectors, trigonometry, and geometry, were sorted into broader categories such as Mathematical/Geometric Reasoning to ensure consistency across semesters. Retention was further analyzed in relation to instructional timing by categorizing each concept into either early, mid, or late semester. Clear gaps in long-term retention across all semesters showed that the most challenging conceptual areas, identified by low averages on the final exam, were Forces, Centripetal Motion, Work/Energy, and Impulse. By identifying persistent conceptual gaps in an introductory physics course, these results offer a data-driven roadmap for refining curriculum to better support long-term retention.

Presenter: **Ange Benise Niyikiza** [$]
Major: Mechanical Engineering and Physics
Email: smurphy12@lamar.edu
Mentor: **Dr. Zhifeng Ren** [$]
Co-author: Peng Ying [$]
[$] Department of Physics and Texas Center for Superconductivity, University of Houston

GR-S / In-progress
P2 – T#5

Synthesis and Characterizations of Boron Arsenide Crystals.

Due to its ultrahigh thermal conductivity, boron arsenide (BAs) has attracted significant attention in both theoretical and experimental research. Compared to diamond, the bulk material with the highest isotropic thermal conductivity, BAs offers additional advantages, including a suitable bandgap (1.8~2.0 eV), high ambipolar mobility, and a thermal expansion coefficient compatible with commonly used semiconductors. These properties make BAs a promising candidate for high-power electronic applications. However, the challenge of growing BAs single crystals with minimal defects remains. In this study, we focus on synthesizing high-quality BAs single crystals using an improved chemical vapor

transport method and evaluating the effectiveness of this approach for crystal growth. We also provide a brief overview of the characterization techniques employed in this work.

Presenter: **Abigayle Welch** [$]
Major: Mechanical Engineering and Physics
Email: awelch7@lamar.edu
Mentor: **Dr. Binod Nainabasti** [$]
[$] Department of Physics, Lamar University

UG-H / Advanced
U.R.G. Project
P2 – T#6

Exploring Physics Knowledge Retention Across Multiple Intelligence Types in Preparatory Physics.

Several studies have examined student knowledge retention and Multiple Intelligence (MI) types, but few have explored the relationship between the two. This study analyzes approximately 250 preparatory physics students to determine whether MI profiles are associated with knowledge retention. Students completed Walter McKenzie's MI survey, a widely used self-reflection instrument that identifies the extent to which individuals exhibit different intelligence types. MI scores were weighted to reflect that students possess varying proportions of multiple intelligences rather than a single dominant type. Retention was measured using exam averages compared with final exam questions drawn from the previously tested course material. Data were analyzed in RStudio using multiple linear regression. Results showed no statistically significant relationship between MI profile and knowledge retention. These findings suggest that students retain physics knowledge at similar rates regardless of their MI distribution, indicating no inherent advantage or disadvantage in retention based on intelligence type.

Presenter: **Harvest Fairchild** [$]
Major: Speech and Hearing Sciences
Email: tpraterberna@lamar.edu
Mentor: **Dr. Raul Prezas** [$]
[$] Department of Speech and Hearing Sciences, Lamar University

UG-S / In-progress
U.R.G. Project
P2 – T#7

Phonemic Clinical Video Assessment: Strategies in Undergraduate SLP Curriculum.

Pre-professional degrees related to rehabilitative healthcare often lack hands-on or clinical experiences due to licensure restrictions and legal complications. This leaves many students feeling unsure when transitioning into professional degrees as there are notable gaps in career readiness and competency. This project aims to evaluate the usefulness of video assessments as a tool directly aligned with current phonetics coursework in undergraduate speech-language pathology education. Specifically, it will explore whether exposure to organic speech samples improves students' transcription accuracy and clinical readiness.

Once all data is collected, participants' transcriptions will be compared to a correct reference created by the primary investigator. Transcriptions will be scored for accuracy, and errors will be categorized to

identify any patterns. Additionally, self-assessments will be compared with transcription scores and study groups to gain a more complex understanding of student self-awareness.

BS_4 – Communication and Media

Location: Sabine 1

Chair: Dr. Andre Favors

Presenter: Regina Maria Ruiz [$]

UG-S / Advanced
BS_4 – T#1

Major: Communication - Journalism
Email: reginaruizrojas@gmail.com
Mentor: **Dr. Nicki Michalski** [$]
[$] Department of Communication and Media, Lamar University

Manufacturing Stardom: The Ethics of K-pop.

The growth of K-pop in the global entertainment sphere has resulted in industry turning into an effective cultural and economic phenomenon for the country; nonetheless, its growing popularity has created some ethical concerns. This research will evaluate the ethical dilemmas associated with the K-pop industry within the frameworks of utilitarianism and deontological ethics, taking into account such aspects as traineeships, working conditions, artist rights, and fan ship. Although there is no doubt that the industry makes a considerable contribution to both the field of entertainment and the economy, a utilitarian view on the issue can create some ethical problems due to the extreme stress to which performers are subjected. Deontological theory of ethics is also likely to be critical of current trends since it focuses on artists' morality in the form of oppressive contracts, restricted personal freedom, and strict beauty standards required by industry. In addition, the role of fans in promoting or criticizing the above-listed practices will be analyzed.

Presenter: Evan Wolford [$]

UG-S / In-progress
BS_4 – T#2

Major: Communication - Film
Email: emw070406@gmail.com
Mentor: **Mr. Andre Favors** [$]
[$] Department of Communication and Media, Lamar University

The Evolution of the One-Shot in Filmmaking.

Stylistic choices in filmmaking both influence trends within film and indicate what is special about the culture and mentality of a specific era. For example, noir themes within film have persisted alongside surges in government distrust. Contemporary filmmaking in the late 2010s and the 2020s has led to innovation and new trends within film that reflect the time and call back to earlier eras of film in the process. In particular, the “oner,” long takes, and one-shots within film have become increasingly prominent within the contemporary, digital age of filmmaking that we are living through. The “oner” and long take in film are lengthy, grandiose, choreographed shots that intricately showcase an important story

beat. A one-shot is a film or TV episode which consists entirely of one shot, or was edited to look like one. Movies and TV shows like Birdman (2014), 1917 (2019), The Studio (2025), and Adolescence (2025) use these techniques to tell their story effectively and are so deeply intertwined that discourse surrounding them almost always mentions these techniques when critiquing and lauding these films. While stemming from films like Alfred Hitchcock's Rope (1948), Birdaman's director, Alejandro González Iñárritu, cites German filmmaker Max Ophüls as a direct influence for his contemporary use of these techniques. This research showcases the evolution of the "oner," long takes, and one-shots within film, the differences between them, why this technique has become increasingly common, and what it may say about the time we are in.

BS_5 – Comics, AI, and Social Issues

Location: Sabine 1

Chair: Dr. Nicki Michalski

Presenter: **Karim Shaaban** $

Major: Chemistry

Email: kshaaban@lamar.edu

Mentor: **Dr. Nicki Michalski** $

$ Department of Communication and Media, Lamar University

UG-S / Advanced
Class. Project
BS_5 – T#1

When Help Arrives.

I will be with the social issues, AI, and comics session. This is a presentation about creating a comic using AI. This project was meant to test the current capabilities of AI and how well it can tell a story. The plot was created by me for the class "Social Issues Through Comics."

Presenter: **Rayna Christy** $

Major: Communication- Journalism

Email: rchristy1@lamar.edu

Mentor: **Dr. Nicki Michalski** $

$ Department of Communication and Media, Lamar University

UG-S / In-progress
Class. Project
BS_5 – T#2

"Just One Bite": A Comic Focused on Eating Disorders and Body Dysmorphia.

While in Dr. Michalski's Honors Social Issues through Comics course, we were tasked with researching a social issue and utilizing artificial intelligence to create a comic addressing said issue. My chosen issue was eating disorders and body dysmorphia. I began by brainstorming the information necessary to fully address the severity of the issue, such as the definitions of common eating disorders and statistics about who may be affected. I used Google Scholar and the library database to compile this research, creating a PowerPoint presentation that addressed everything. I then used ChatGPT to create the comic, using trial and error to find prompts that helped me to reach images that matched my ideas. Finally, I created the comic "Just One Bite," which tells the story of a young girl struggling with anorexia and body dysmorphia. It does not include much text to portray the feeling of solitude and silence that often accompanies an eating disorder. I presented this to my class, helping to raise awareness of eating disorders and body dysmorphia, and found that the comic was a very effective aid as it gave them something visual and creative to look at after learning the facts about these issues.

Presenter: L. Nichole McKee [$]
Major: Economics
Email: lmckee7@uco.edu
Mentor: **Dr. Kuang-Chung Hsu** [$]
Co-author: Teresa Carrion [$]
[$] Department of Economics, University of Central Oklahoma

UG-S / In-progress
Class. Project
P2 – T#5

Protectionism, "Push" Factors, and Service Sector "Pull": A New Look at Low-Skilled Female Migration.

How do U.S. protectionist policies affect the migration flows of low-skilled Hispanic women, and what is the specific labor market channel that absorbs this flow?

This thesis investigates the causal relationship between U.S. trade protectionism, and the migration of low-skilled Hispanic women. While economic theory and recent empirical work suggest that trade barriers increase migration, these models attribute the effect to capital-skill complementarity. They predict a rise in high-skilled immigration, suggesting protectionism drives capital inflows which demand skilled labor. This finding presents a significant theoretical puzzle for the current policy landscape. It fails to explain the persistent and rising migration of low-skilled women despite protectionist measures that, in theory, should reduce demand for low-skilled labor in the U.S.'s tradeable sector. To resolve this tension, we propose a novel "Push-Pull" framework that disaggregates the drivers of migration for this specific group. Our primary hypothesis challenges the standard view by arguing that tariffs on Latin American exports in female-intensive sectors act as a severe economic push. By destroying employment opportunities in the origin countries, tariffs amplify economic insecurity and displace women from the local labor market. This push is met by a structural pull from the U.S. service sector. Using Cortés (2022), we argue that demand in this sector is driven by needs of high-skilled native women and remains insulated from policy shocks, creating an absorption mechanism for displaced workers. Methodologically, this study employs a panel data analysis using a Fixed Effects model on a Country-Year dataset constructed from IPUMS USA (ACS) migration microdata and USITC bilateral tariff data. This approach allows the isolation of tariff impacts while controlling for unobserved country heterogeneity and economic trends. The research design includes a Difference-in-Differences (DiD) specification to exploit tariff spikes. By empirically linking trade policy shocks to service-sector migration flows, this research demonstrates a policy paradox: that U.S. protectionism may increase low-skilled migration by destroying the export-oriented jobs that would keep workers in their countries.

BS_6 – Applicative Research – Graduate Session

Location: Neches 120

Chair: Dr. Mamta Singh

Presenter: **Deepak Puri** [$]
Major: Electrical Engineering
Email: purideepak360@gmail.com
Mentor: **Dr. Mamta Singh** [#]
[$] Phillip Drayer Department of Electrical and Computer Engineering, Lamar University
[#] Department of Curriculum & Instruction, Lamar University

GR-H / Early-Phase
Center of Research at Lamar
BS_6– T#1

Assessing Preservice Teachers' Knowledge and Understanding of Dredging and Its Environmental Implications through TEKS-Aligned Instruction.

Dredging refers to the excavation and relocation or disposal of sediments and debris from the bottom of water bodies. It plays a critical role in economic development, environmental remediation, coastal protection, and disaster response. However, when not properly managed, dredging can result in significant ecological degradation. Despite these environmental implications, limited research has examined how dredging concepts are incorporated into educational contexts, particularly within preservice teacher preparation. This gap is evident in teacher education, where insufficient attention has been given to how preservice teachers understand dredging and align related concepts with curriculum standards such as the Texas Essential Knowledge and Skills (TEKS). This study aims to assess preservice teachers' understanding of dredging and its environmental implications, evaluate changes in their knowledge following instruction, and examine how they align these concepts with TEKS for elementary education. A mixed-methods research design was employed. Participants completed a pre-assessment,

engaged in an instructional activity, and then completed a post-assessment to measure gains in understanding. In addition, participants developed TEKS progression tables focused on dredging and its environmental implications. These tables will be evaluated using a structured rubric to assess both conceptual understanding and standards alignment, with results to be shared subsequently.

Presenter: Kenidy Bennett [$]
Major: Psychology
Email: kbennett10@lamar.edu
Mentor: **Dr. Mamta Singh** [#]
[$] Department of Psychology, Lamar University
[#] Department of Curriculum & Instruction, Lamar University

UG-H / Early-phase
Faculty Research Grant
BS_6– T#2

Body Image and Eating Behaviors: Examining the Relationship Between Body Image Perceptions and Nutritional Habits Among College Students.

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Presenter: Alyvia Ott [$]
Major: **Interdisciplinary Studies**
Email: aott@lamar.edu
Mentor: **Dr. Mamta Singh** [$]
[$] Department of Curriculum & Instruction, Lamar University

UG-H / Early-phase
Honors Project
BS_6– T#3

Vertical Alignment of TEKS for Biodiversity & Ecosystems in EC-6 Science.

This study examines the role of vertical alignment of the Texas Essential Knowledge and Skills (TEKS) in supporting student understanding of biodiversity and ecosystems across Early Childhood through Grade 6 (EC-6). Vertical alignment ensures that concepts related to living organisms, habitats, and environmental interactions progress systematically, moving from foundational observation-based learning in the early grades to more complex ecological reasoning in upper elementary levels. Through an analysis of EC-6 science TEKS, this study illustrates how aligned instruction promotes instructional continuity by building on prior knowledge while gradually introducing advanced concepts such as food webs, adaptations, and human impacts on ecosystems. Findings indicate that vertically aligned instruction enhances conceptual coherence, minimizes learning gaps, and supports the development of scientific inquiry skills. The study underscores the importance of teacher collaboration, curriculum mapping, and data-informed instructional planning in achieving effective vertical alignment. Implications for educational practice include improved instructional consistency, deeper student comprehension of biodiversity concepts, and increased preparedness for secondary-level science learning. Additionally, the study highlights the value of training pre-service teachers in vertical alignment to strengthen curriculum understanding, support responsive lesson design, and foster sustained academic growth. Overall, vertically aligned instruction contributes to a cohesive and progressive learning experience that supports long-term student success across grade levels.

GR-H / In-progress
Faculty Research Grant
BS_6– T#6

Presenter: Kenidy Bennett [$]
Major: Psychology
Email: kbennett10@lamar.edu
Mentor: **Dr. Mamta Singh** [#]
[$] Department of Psychology, Lamar University
[#] Department of Curriculum & Instruction, Lamar University

Dredged Materials: What They Are and Why They Matter.

Dredging refers to the excavation and relocation or disposal of sediments and debris from the bottom of water bodies. It plays a critical role in economic development, environmental remediation, coastal protection, and disaster response. However, when not properly managed, dredging can result in significant ecological degradation. Despite these environmental implications, limited research has examined how dredging concepts are incorporated into educational contexts, particularly within preservice teacher preparation. This gap is evident in teacher education, where insufficient attention has been given to how preservice teachers understand dredging and align related concepts with curriculum standards such as the Texas Essential Knowledge and Skills (TEKS). This study aims to assess preservice teachers' understanding of dredging and its environmental implications, evaluate changes in their knowledge following instruction, and examine how they align these concepts with TEKS for elementary education. A mixed-methods research design was employed. Participants completed a pre-assessment, engaged in an instructional activity, and then completed a post-assessment to measure gains in understanding. In addition, participants developed TEKS progression tables focused on dredging and its environmental implications. These tables will be evaluated using a structured rubric to assess both conceptual understanding and standards alignment, with results to be shared subsequently.

Office of Undergraduate Research
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