The University of Texas
Rio Grande Valley
College of Sciences

ARC2018

College of Sciences Annual Research Conference

FRIDAY, APRIL 13th, 2018

The University of Texas
Rio Grande Valley
1201 W. University Dr.
Edinburg, TX, 78539

The University of Texas Rio Grande Valley
College of Sciences

2018 College of Sciences
Annual Research Conference

April 13, 2018
Edinburg (ECESS 1.300)
1407 E. Freddy Gonzalez Dr.
Edinburg, TX 78542

Organizing Committee:
Dr. Parwinder Grewal, Co-Chair
Dr. Karen Martirosyan, Co-Chair
Dr. Mohammed Farooqui
Dr. Alexis Racelis
Dr. Virgil Pierce
Leonardo Vazquez

Conference Technical Team:
Maria Lisa Trevino
Jackelyn Melgar
Daniel Rodriguez
Samantha Lopez
Odessa Gutierrez

Conference Program

8:00 – 9:00 AM Registration & poster setup **ECESS 1.300**

9:00 AM – Dr. Parwinder Grewal, UTRGV Executive Vice President for Research, Graduate Studies, and New Program Development, Overview of Research and Graduate Programs

Keynote session:
Chair: Dr. Karen Martirosyan
Associate Dean for Research and Educational Innovation

9:10 AM - Dr. Aaron Wilson - Assessing the impacts of community outreach – A near-peer mathematical mentoring approach

9:30 AM - Dr. Hyung Kim - College Instructors' Attitudes toward Confidence Intervals Time

9:50 AM - Dr. Baofeng Feng - Mathematical modeling in nonlinear optics

10:10 AM - Dr. Karen Yagdjian - Integral Transform Approach to Partial Differential Equations of Quantum Field Theory and Cosmology

10:30 AM - Dr. Jameela Banu - Bone protective properties of Sylvia hispanica in postmenopausal rat model

10:50 AM - Dr. Yuanbing Mao - From Synthesis and Nano-Effects to Luminescence Properties of Mixed Metal Oxide Nanoparticles

11:10 AM - Dr. Natalia Guevara and Dr. Juan Guevara - Applications of Apo B100-derived peptides for nucleic acid delivery

11:30 AM - Dr. Mircea Chipara - Structural Features in Complex One-Dimensional Polymer Based Materials

11:50 AM - Dr. Marcio Almeida - Computational Biology, on collaborative work of SMSS and STDOI.

12:00 PM – 12:45 PM LUNCH

12:45 – 2:00 PM Poster Session (ECESS 1.300)
Chair: Dr. Mohammed Farooqui

2:00 PM – 3:20 PM Student Oral Presentations

4:00 PM – 5:00 PM AWARDS CEREMONY (ECESS 1.300)
Chair: Dr. Parwinder Grewal

Oral Session 1 - OS1
Chair: Dr. Mircea Chipara
Location:

2:00 PM - Alan Perez, Optical and Structural Properties in LaF3:Yb,Er -

2:20 PM - Chloe Doiron, Selective Thermal Emitters with Extreme Asymmetry as a Platform for Studying Non-Hermitian Systems

2:40 PM - Anton Gribovskiy, Design, Fabrication, and Characterization of Integrated Silicon Microring Resonators

3:00 PM - Fatemeh Mostafavi, Transition between different Ground states without undergoing adiabatic Process

3:20 PM - Adrian Torres, The Inverse Scattering Transform for the Nonlinear Schrodinger Equation

Oral Session 2 - OS2
Chair: Dr. Ahmed Touhami
Location:

2:00 PM - Jonathan Rock, Chemoselective concurrent synthesis of benzimidazoles and 1,2-disubstituted benzimidazoles: Greener route and in vitro anti-cervical cancer evaluation

2:20 PM - Carlos Trevino De Leo, Microfluidic Processing of Dextran Coated Superparamagnetic Nanoparticles of Iron Oxide

2:40 PM - Nareg Ohannesian, Magnetic Polymer Composite As a Thermosensitive Agent For Induced Hyperthermia

3:00 PM - Jackson Johnstone, Influence in Response to Elevated Temperature on Gonadal Functions in Purple Sea Urchin

3:20 PM - Madeline Marshall, Progress and potential of two biological control agents of the invasive giant reed (Arundo donax L.)

ORAL PRESENTATIONS

OS1 -1

Optical and Structural Properties in LaF3:Yb,Er

Alan Perez[a,b], Santosh K. Gupta[b,d], Madhab Madhab[a], Yuanbing Mao[b,c]
[a]Department of Physics and Astronomy, [b]Department of Chemistry, [c]School of Earth, Environment, and Marine Sciences, University of Texas Rio Grande Valley, [d]Radiochemistry Division, Bhabha Atomic Research Centre, Mumbai, India - 400085

LaF_3:Er,Yb nanostructures were synthesized and studied for their optimal optical properties, throughout undergraduate at UTRGV, under parameters not yet reported by other research in the literature. Calculations on band and crystal structure were also conducted. A systematic approach has been taken in identifying the mechanism by which the radiative energy levels are populated – a topic of dispute for the erbium-ytterbium doped system. Up-conversion emissions of $^2H_{11/2}$ and $^4S_{3/2}$ are populated by a two-photon absorption process from 980nm excitation by ESA and ETU. Population of $^4F_{9/2}$ – $^4I_{15/2}$ red emission is also studied for its nonlinear dynamics. Furthermore, the increase in down-conversion emissions; namely, the $^4I_{13/2}$–$^4I_{15/2}$ (1541 nm), and $^4I_{11/2}$–$^4I_{13/2}$ (2755) nm states; have also been investigated under 980 nm excitation.

OS1-2

Selective Thermal Emitters with Extreme Asymmetry as a Platform for Studying Non-Hermitian Systems

Chloe F. Doiron[1,2] and Gururaj V. Naik[1]
[1]Department of Electrical and Computer Engineering, Rice University, Houston TX, 77005
[2]Smalley-Curl Institute Applied Physics Program, Rice University, Houston TX, 77005

Hermitian systems possess real eigenvalues and hence describe real world systems. However, Hermiticity is only a sufficient condition for real eigenvalues. Non-Hermitian systems with parity and time symmetry have been shown to exhibit real eigenvalues. Such non-Hermitian systems possess exceptional points in their phase space and exhibit interesting topological properties. The implementation of non-Hermitian systems is easier in optics and has gained attention in recent years. One such optical system that is always non-Hermitian is a thermal emitter. Here, we present a method to create a non-Hermitian thermal emitter by coupling a photonic and plasmonic resonance, with extreme asymmetry in optical losses. The photonic resonance has low optical losses enabling a high quality factor (Q-factor) resonance, but at the cost of low thermal emission. On the other hand, the plasmonic resonance has large optical losses leading to a low Q-factor resonance, but with significant thermal emission. When coupled together, the hybrid photonic-plasmonic resonances can achieve near unity emissivity, the limit from Planck's law, and high Q-factors. We will present experimental measurements of thermal emission demonstrating the ability to tune Q-factor, by adjusting the coupling between the photonic and plasmonic resonances. We conclude that these oscillators can be treated as two coupled oscillators forming an exciting platform to study non-Hermitian systems.

OS1-3

Design, Fabrication, and Characterization of Integrated Silicon Microring Resonators

A. Gribovskiy and M. Rakhmanov

Department of Physics and Astronomy, University of Texas Rio Grande Valley

Microring resonators are major building blocks for newly emerging silicon integrated nanophotonic circuits. These devices are widely used as narrow-band filters and efficient wavelength multiplexers for applications in biomedical research, sensor technology, and high bandwidth data transfer. The micrometer-size of such resonators is crucial for modulation of light at gigahertz frequencies. The data transfer rates above a hundred gigabits per second have already been achieved with this technology. Moreover, research is underway for microring resonators as logic elements for optical micro-processors in future all-optical computing. Measurement of the parameters of microring resonators is important for understanding of their performance. However, very small size of such devices poses serious challenges for any such measurement. For example, the standard approach to measure the resonator line width is the ring-down technique which becomes problematic due to their extremely short storage time. Therefore, we developed a different method based on GHz modulation of light and applied it to microring resonators. We demonstrated that this method is successful for measurements of the line width of resonators. We also used this method to measure the nonlinear properties of our microring resonators. This research consisted of three separate stages: design, fabrication, and characterization of the microring resonators, all of which we did ourselves. We used FDTD simulation to design and optimize the layout of the microring circuit. We fabricated the device on a silicon-on-insulater wafer using electron beam lithography and reactive ion etching. The fabrication part of this work was done at the Clean Room of the University of Houston. The measurements of optical properties of these devices were made in Optics and Nanophotonics Laboratory at UTRGV. This was the first time when an integrated nanophotonic circuit was designed, built, and operated at UTRGV and by UTRGV researchers.

OS1-4

Transition between different Ground states without undergoing adiabatic Process

Fatemeh Mostafavi and Hamidreza Ramezani

Department of Physics and Astronomy, University of Texas Rio Grande Valley

Adiabatic Process is a common approach to describe the evolution of a system which undergoes slow changes. According to the adiabatic theorem, a system remains always in one of its eigenstates, when it goes through slow successive changes. In practice, finding a realistic adiabatic process is almost impossible due to the existence of some non-adiabatic parameters in the system. To bypass this problem many approaches, known as "shortcuts to adiabaticity", has been proposed including counter-adiabatic drives, non-linear correction, and non-Hermitian decoupling. However, all these approaches provide the shortcut with the cost of providing more energy to the system. Here we propose a new class of Hamiltonians that provides an alternative approach to shortcut to adiabaticity. Precisely, the internal dynamical properties of our system take the system to the desired eigenstate, rather than forcing the system to end in that state. In our approach, the Hamiltonian of the system can be directly and spontaneously set to its final form, dictated by our conditions, without being worried about the intermediate states and the equilibrium condition. Our proposed non-Hermitian Hamiltonians are constructed such that the eigen-

modes are half real-half complex. The complex mode decays dynamically and thus, the system evolves to its other eigenstate. Our proposed shortcut to adiabaticity can reduce the cost of the adiabatic process and remove the existing complications in other approaches for an adiabatic process.

OS1-5

The Inverse Scattering Transform for the Nonlinear Schrodinger Equation

Adrian Torres and Baofeng Feng; School of Mathematical and Statistical Sciences, University of Texas Rio Grande Valley.

In this talk, we will show how to solve the nonlinear Schrodinger (NLS) equation via the inverse scattering transformation method, which is a two-component problem. We will present the direct scattering problem, as well as the time evolution of the scattering date. Then, we will show the Gelfand-Levitan-Marchenko (GLM) equation in order to solve the inverse scattering problem of the NLS equation. Finally, we will construct and show explicit soliton to one- and two-soliton solutions for the reflectionless case.

OS2-1

Chemoselective concurrent synthesis of benzimidazoles and 1,2-disubstituted benzimidazoles: Greener route and in vitro anti-cervical cancer evaluation

Jonathan M. Rock[1], Daniel Garcia[1], Jessica Cruz[1], Eder Arredondo-Espinoza[2], Fabian Olazaran-Santibanez[1,2], Isaias Balderas-Renteria[2], Debasish Bandyopadhyay[1]

[1]Department of Chemistry, The University of Texas Rio Grande Valley, 1201 West University Drive, Edinburg, Texas 78539, USA

[2]Universidad Autonoma de Nuevo Leon, Facultad de Ciencias Químicas, Ciudad Universitaria, San Nicolás de los Garza, Nuevo León, 64451, México

Azaheterocycles play important role in medicinal chemistry and drug discovery research among which benzimidazole, a fused bicyclic scaffold of benzene and imidazole, is considered as a privileged moiety. As a part of our ongoing research to develop greener methodologies targeted to pharmacologically relevant molecules, a new chemoselective greener route has been developed to synthesize substituted benzimidazoles and 1,2-disubstituted benzimidazoles concurrently in one-pot. Sonication was used as a green energy source to accomplish the synthesis of diversely substituted compounds with novel structures. Spectroscopic studies (FT-IR, NMR and HRMS) were carried out to elucidate the structures and in few cases X-ray crystallographic analysis was also performed. Some of these compounds demonstrated in vitro good to excellent anti-cervical cancer activity against SiHa cell lines.

OS2-2

Magnetic Polymer Composite As a Thermosensitive Agent For Induced Hyperthermia

Nareg Ohannesian and Karen S. Martirosyan

Department of Physics and Astronomy, University of Texas Rio Grande Valley

Over the past decade, Magnetic Induced hyperthermia (MIH) has been introduced in the medical sector as a therapeutic procedure, considered one of the most promising approaches into treating tumors and inflammations with slightly healthy cell collateral damage. MIH requires insertion of magnetic nanoparticles at the target area, and generation of heat through applying an Alternative Magnetic Field (AMF), thus exposing higher temperatures (above 37°C) to the infected region. Healthy cells are naturally resistant to heat at most a temperature of 46°C, while tumors and inflammations that are mostly mutated cells are less resistant to heat at a range of 42-46°C.

In this study, Polyetheretherketone (PEEK) - magnetite (Fe_3O_4) blended compounds were produced by high speed vibration milling of PEEK-Fe_3O_4 powders exposed to hexane and heated to the melting point (~350°C) to form the homogeneous magnetic polymer composite, which provided a uniform dispersion of magnetite with low agglomerations in the polymer matrix. Polymer composite with 10 wt.% of magnetite displayed a magnetic saturation of 8 emu/g, tensile strength of 60 MPa and Young's modulus of 4.4 GPa. Biotoxicity assessment was conducted via in vitro assay. The composite did not induce any adverse reactions, permitting use in medical applications. This study develops analytical relationships and computation of power dissipation of a magnetic material subjected to an alternating magnetic field. Calorimetric measurements of specific power absorption showed about 202 W/g upon cancelling the Brownian motion of magnetite through the encapsulation of the magnetic particles within the polymeric matrices leaving only Neel as the heat loss mechanism.

OS2-3

Microfluidic Processing of Dextran Coated Superparamagnetic Nanoparticles of Iron Oxide

Carlos Trevino De Leo, Nareg Ohannesian and Karen S. Martirosyan
Department of Physics and Astronomy, University of Texas Rio Grande Valley

Superparamagnetism is defined as the form of magnetism in which particles have single-domain magnetic moments and do not retain any net magnetization when an external magnetic field is removed. For particles to have single-domain magnetic moments, they must be smaller than 80nm in diameter. Superparamagnetic magnetite nanoparticles were synthesized by mixing Iron (II) Sulfate Heptahydrate and Iron (III) Nitrate Nonahydrate with Sodium Hydroxide in stoichiometric quantities with presence of Dextran as a surfactant via microfluidic process, resulting in nanoparticles predominately around 10nm. The amount of Dextran determines the particles spherical shapes and magnetic state of the nanoparticles. This method resulted producing particles from ferromagnetic to superparamagnetic form. In addition, the pH of the solution could be also used to tune nanoparticle magnetic behavior since it was observed that ferromagnetic particles produced with an acidic pH while superparamagnetic nanoparticles with a base pH values. Further experimentation is needed for alteration of the particles magnetic properties (coercive force, magnetic saturation, blocking temperature and other) by varying pH values. Major potential applications for superparamagnetic nanoparticles are in the biomedical field as a theranostics agent for cancer diagnosis and therapy applications including Magnetic Induced Hyperthermia Therapy. We would like to acknowledge the financial support of this research by the NSF PREM (award DMR-1523577: UTRGV-UMN Partnership for Fostering Innovation by Bridging Excellence in Research and Student Success).

OS2-4

Influence in Response to Elevated Temperature on Gonadal Functions in Purple Sea Urchin

Jackson Johnstone[1], and Md Saydur Rahman[1,2]
[1]School of Earth, Environmental and Marine Sciences, UTRGV
[2]Department of Biology, UTRGV

Ocean temperatures have been increasing consistently during the past three decades due to anthropogenic activities, which leads to increased global climate change. Rising sea surface temperatures continue to have a pronounced impact on marine environments. Sea urchins are excellent indicator species with regards to

their response to global climate change. They are an ancient and relatively simple animal, meaning that there are fewer internal mechanisms to deal with when observing responses. For this study, we tested ovarian and testicular development, heat shock protein expression, and coelomic fluid pH in Atlantic purple sea urchin (*Arbacia punctulata*) at three different temperatures. Ten sea urchins each were placed in six aquariums (with a 20 gallon capacity) with high temperatures (28 and 32°C) and control variable (24°C) under controlled laboratory conditions for a 7-day period. Sea urchins exposed to high temperature had lower gonadal growth (gonad weight/body weight*100) compared to controls. The percentage of ova (mature eggs) and production of sperm in sea urchin gonads were significantly lower when exposed to high temperature compared to controls, indicating impaired gonadal functions at high temperatures. Sea urchins exposed to high temperature also showed an increase in heat shock protein expression in eggs and spermatogenic cells, and a decrease in coelomic fluid pH compared to controls. These results suggest that elevated sea water temperature reduces/acidifies pH of coelomic fluid which might be involved in the impairment of reproductive functions in Atlantic sea urchin.

OS2-5

Progress and potential of two biological control agents of the invasive giant reed (Arundo donax L.)

Madeline Marshall and Alexis Racelis

School of Earth, Environmental and Marine Sciences, UTRGV

Biological control, or the use of natural enemies for pest management, may the best long-term option for managing the invasive *Arundo donax*, a noxious weed dominating riparian habitats globally and along the Rio Grande River. This work reports on the progress and potential of two arundo biological control agents permitted for release in Texas and Mexico. The arundo wasp, *Tetramesa romana*, released in 2009, is having significant impacts as reported from various field locations around the world, described here using standard exit hole counts. The highest density levels were found in Texas (introduced range) compared to relatively low populations in the native range (ave. exit holes = 79.98, $p = 0.001$ and 4.81, $p = 0.001$ respectively). *Lasioptera donacis*, the arundo leaf miner, is currently permitted for release in North America. Field research was conducted in the native range of *L. donacis* (Greece) to evaluate the biotic and abiotic factors that influence population density. *Lasioptera donacis* feeding damage was documented on 40.4 and 67.8% of dead and decaying leaf sheaths respectively across all sites. Lasioptera donacis was active in all locations including highly disturbed sites, but showed a slight preference for sites near running freshwater sources ($R = -0.514$, $p = 0.000$) and lower densities adjacent to salt water sources ($R = 0.463$, $p = 0.000$). The environmental preferences of *L. donacis* in Europe signal strong potential for impact in the U.S. where *A. donax* is invasive.

Poster Presentations

Physics

P1

A control of localized surface phonon polariton resonances using hyperbolic material boundary

Satyanarayana Kachiraju and Myoung-Hwan Kim
Department of Physics and Astronomy, University of Texas Rio Grande Valley

Metallic nanostructures have been used widely for a metasurface unit, especially at near infrared, but highly efficient metallic metasurfaces are difficult to realize at longer infrared light including mid-/far infrared due to the high intrinsic optical loss. In this work, we experimentally demonstrated a new type of metasurfaces working at mid-infrared light by utilizing localized surface phonon polariton resonances with hyperbolic material boundary. Silicon carbide was chosen because of the optical phonon active band in mid-infrared which induces surface phonon polaritons. We used high-indexed hyperbolic material boundary to confine and control the localized surface phonon polaritons. Hyperbolic material consists of silicon and metal multilayers. Plasma-enhanced chemical vapor deposition, electron beam lithography, electron beam deposition, and reactive ion etching were used for the device fabrication. We constructed array of 100-microns-square-area devices each of which consists of 100 nm scale hyperbolic material gratings on silicon carbide. Atomic force microscope and scanning electron microscope were used for the device imaging and characterization. The grating depth (< 100nm) was well-established by dry etching procedures. Optical measurements were performed in using Fourier-transform infrared spectrometer with microscope. The infrared spectrum shows single and well-defined resonances which agree with full-wave simulation results. The single resonance indicates dipolar Mie-resonance. The polaritonic resonance is widely accessible in whole optical phonon band of silicon carbide from 10.3 – 12.5 microns. Hyperbolic material can control index of refraction from 4 to 7.5. This new metasurface platform will be a main building block for flat optical components and nanophotonic devices.

P2

Automation of terahertz time domain spectroscopy system

Moldir Baimurat and Myoung-Hwan Kim
Department of Physics and Astronomy, University of Texas Rio Grande Valley

Terahertz (THz) electromagnetic radiation is located between microwave and infrared parts of the electromagnetic spectrum. Short pulses of THz light are widely used in time-domain spectroscopy (TDS) and imaging system. Terahertz radiation enables to advance DNA research in single molecule level and material science research in observing charge carrier dynamics, and especially nondestructive testing in the industry and medical diagnostic applications. The purpose of this research project is the development of a control system for time-domain spectroscopy, because THz-TDS requires many automated controls in data acquisition and delay line. The first stage is to develop the program for control of time delay of near-infrared pulses using motorized linear translation stage using visual programming language, National Instruments LabView. The next step is collection of the terahertz signal probed by a lock-in amplifier and the balanced photodetector system. The time domain terahertz spectrum can be transformed into the frequency domain THz spectrum using Fourier transformation. This research will help to build automated THz-TDS system in the research laboratory for metasurfaces and material sciences in the THz spectral regime.

P3

Glutaraldehyde-Chitosan Hydrogels Characterized and Fabricated for Biomedical Improvement

Perla Leyva and Ahmed Touhami

Department of Physics and Astronomy, University of Texas Rio Grande Valley

Over the last decade, hydrogels have gained popularity among biomaterial scientists for various biomedical and biotechnological applications. Due to their biocompatibility properties, inexpensive fabrication process, and its extensive interchangeable materials for fabrication, hydrogels become potential candidates for tissue engineering and drug delivery. Our interest is biopolymer chitosan, an abundant and renewable material that is safe, biocompatible, biodegradable, and non-toxic. Equally important is glutaraldehyde, an effective bifunctional crosslinking agent that is water soluble, clinically acceptable, and inexpensive. Due to these aspects, the present research focuses on the preparation and characterization of Glutaraldehyde-Chitosan hydrogels (GChs) that mimics the physical, chemical, and natural properties of most biological matrixes. Currently, we are focusing on determining the appropriate cross-liker concentration needed to fabricate a hydrogel with an adequate mechanical strength. An advanced protocol was formulated taking into consideration previous studies and current literature. 3D micro-porous chitosan scaffolds were fabricated by dissolving chitosan in acetic acid and NaOH solution. The foaming was achieved by adding glutaraldehyde as a cross-linker. On the other hand, for the characterization, the swelling properties of the fabricated hydrogels were analyzed utilizing samples of different cross-linker concentration by swelling the samples in double distilled water at room temperature for 3 days to achieve equilibrium. The swelling test was measured at intervals of 5, 10, 20, 30 minutes, 1,5 hour, 1, 2, and 3 days. Our data shows that hydrogels with a higher cross-linker concentration have a lower swelling percentage, and become brittle which deprives them from completing the swelling test. However, with a lower cross-linker concentration, gels exhibit higher swelling percentages, noticeable size increment, tend to become soft and capable of completing the test successfully. Based on these results, we concluded that changes in the glutaraldehyde concentrations can generate significant variations in the swelling and physical properties of the hydrogels.

P4

Robotization of the Resaca de la Palma Observatory

A. H. Lee, M. Beroiz, R. Camuccio, M. Castillo, M. Diaz, J. Garcia, A. Gonzalez, J. Olivares, A. Zadrozny

Department of Physics and Astronomy, University of Texas Rio Grande Valley

The Observatory at the Resaca de la Palma State Park offers good observation conditions in the Brownsville area. We plan to robotize the telescope so that it can operate remotely and autonomous during observable nights. The plan consists of implementing the open source package INDI and a system of communicating processing hubs to schedule targets and respond to new user requests remotely. In this poster, we describe some of the steps that will be necessary to accomplish the robotization objective.

P5

Analysis of the image taken to search for optical counterparts to GW170104

J. Garcia, M. Beroiz, R. Camuccio, M. Castillo, M. Diaz, A. Zadrozny

Department of Physics and Astronomy, University of Texas Rio Grande Valley

GW170104 was a gravitational wave signal detected by the LIGO observatory on 4 January 2017. One 1 June 2017, the LIGO and Virgo collaborations announced that they had reliably verified the signal, making it the third such gravitational wave signal discovered, after GW150914 and GW151226. The TOROS Collaboration took images in the night of 13 Jan 2017 and thereafter, looking for potential optical counterparts to this gravitational wave. In this poster, we describe the selection of probable targets, the search for tran-

sients in the scanned areas, and the results of image difference analysis on the frames. Although no optical counterparts are expected for a binary black hole merger, the analysis of the data allows us to put in place a software pipeline to analyze future data.

P6

TOROS photometric detection and analysis of optical counterpart SSS17a to GW170817

M. Beroiz, R. Camuccio, M. Castillo, M. Diaz, J. Garcia, A. Zadrozny
Department of Physics and Astronomy, University of Texas Rio Grande Valley

The gravitational wave GW170817, which was detected by the LIGO observatory on 17 August 2017, was the first signal to have an observed electromagnetic counterpart. In the optical and near-infrared bands, these components are observed to be r-process emission sources, called kilonovae. The TOROS Collaboration took part in the optical detection of this event, known as SSS17a, responding with telescopes in Argentina and Chile. In this poster, we describe the optical observations made of SSS17a, the photometry and light curve analysis produced, and the comparison of observational data to theoretical kilonova models.

P7

Search methods for optical transients in galaxies

R. Camuccio, A. H. Lee, A. H. Lee
Department of Physics and Astronomy, University of Texas Rio Grande Valley

A kilonova is an astronomical event which occurs when two neutron stars or a neutron star and a black hole merge. They are the optical counterpart of a gravitational wave (GW), just recently observed for the first time. By following up GW events, we can have the possibility of observing the kilonova connected to that event. However, these events are very short-lived, lasting at most a couple of days in the visible spectrum. Also, the probable region on the sky from which the GW source is expected to have propagated is too large to be searched in its entirety in such a short amount of time. Observing galaxies is the best way of improving the chances of finding such events. The first step of the project would be to decide what kind of galaxies we are going to observe from our region of the sky with the equipment that we have. In this project, we will show how we choose our galactic targets, how we conduct image subtraction, and how we apply photometric measurements.

P8

Pipeline for variable star detection and characterization

Moises Castillo and Mario Diaz
Department of Physics and Astronomy, University of Texas Rio Grande Valley

Variable stars can be observed through optical observation by measuring the change in magnitude over time. A subset of variable stars are eclipsing binary (EB) star systems. This project outlines a pipeline to detect variable stars by plotting light curves for several stars in a shared field of view of known EB. The goal of this project is to detect variable stars and characterize the star system. Currently, pipelines that create light curves have been created with dependencies on other software. The purpose of this project is to streamline the process using only python.

P9

Transient classification using SVM & KNN

Ervin Vilchis and Mario Diaz
Department of Physics and Astronomy, University of Texas Rio Grande Valley

A very important field of Astronomy is the study of transient events. Transients involve astronomical phenomena that can last a few minutes or months, but that are not a permanent feature of the sky. Supernova, kilonovae, novae, variable stars, cataclysmic variable stars are all examples of transient phenomena and in general emit electromagnetic radiation only during a short period of time. A typical way of detecting the very faint

ones is performing differential photometry. An image of the putative event is compared with a reference one which was taken from the same region of the sky at a different epoch. The resulting image should only show the transient event. In reality it contains artifacts which are a result of the subtraction process. These artifacts hinder the recognition of true transients. The events detected in the difference image can be classified as “bogus” or "real” depending on many different factors including their morphology and shape. Humans can assist in training algorithms which can separate the real events from the bogus ones. Support Vector Machine (SVM) and k-nearest neighbors (KNN) are methods which can be used for the classification. The classification problem in this experiment consists in separating these two classes of potential transients. The utility to apply the automation of this project is to reduce the time on the classification. These methods will analyze the data and compare it with some parameters for greater efficiency. The results of this particular experiment show that the accuracy of the SVM was 0.96 to 0.97%, while the KNN accuracy was 0.98 to 0.99%.

P10

How does Growth Temperature Impact Bacterial Adhesion and Nano-mechanics?

Rim Touhami and Ahmed Touhami

Department of Physics and Astronomy, University of Texas Rio Grande Valley

The objective of this project is to investigate how bacterial adhesion and nano-mechanics are affected by changes in growth temperature. When bacterial biofilms build up on surfaces it leads to serious diseases and costly industrial damages. For instance, biofilms that develop on food surfaces can result in spoilage or food poisoning, and those that build up on a ship's hull can cause the metal to erode. Since the adhesion of biofilms to some surfaces can be very costly, and in extreme cases, fatal, this experiment will test how the adhesion of a single bacterium can be altered based on the temperatures at which it grew. In this study, we applied AFM force spectroscopy to probe the adhesion and mechanics of Staphylococcus epidermidis over two temperatures (37°C and 40°C). Our measurements demonstrate that the maximum adhesion force and the distance the bacterium stretched when pulled by the AFM tip both decreased when the temperature is increased to 40°C. In addition, the surface of the bacterium becomes weaker and less sticky. The understanding of how to alter the stickiness of a single cell can be applied to entire biofilms. Furthermore, if bacteria can be made less adhesive due to certain temperatures of its surroundings, then biofilms can be more easily eradicated.

P11

Nanostructural and Nanomechanical Properties of Pseudomonas aeruginosa Pili

Kassandra Cervantes and Ahmed Touhami

Department of Physics and Astronomy, University of Texas Rio Grande Valley

A variety of bacterial pathogens use nanoscale protein fibers known as Type IV pili to mediate cell adhesion, a primary step leading to infection. Pili play an essential role in bacterial colonization, since they are used in the initial stages of biofilm formation, in which reversible adherent forces are important. Because biofilm-associated microbes are resistant to many antimicrobial agents, there is an urgent need to better understand the molecular basis of biofilm formation. By having knowledge of the mechanisms by which bacterial pili adhere to host cells and withstand external forces is critical to our understanding of their functional roles and offers exciting avenues in biomedicine for controlling the adhesion of bacterial pathogens and probiotics. First, we use Atomic Force Microscopy (AFM) to produce high resolution three dimensional images of type IV pili isolated from *Pseudomonas aeruginosa* bacteria. An individual pilus ranges in length from 0.5 to 10 µm and has a diameter from 4 to 10 nm, although often, pili bundles in which the individual filaments differed in both length and diameter were seen. Next, the AFM PeakForce QNM mode is used to investigate nanomechanical properties (elasticity, adhesion, and deformation), of single pilus. Our measurements show that pili are

flexible filaments that can withstand force up to 200 pN. These mechanical properties may represent a generic mechanism among bacterial pili for strengthening adhesion and withstanding shear stresses in the natural environment. The nanomechanical experiments presented here may help us to design molecules

P12

Biocidal Effect of Atomized Positively Charged Dextran Coated Silver Oxide Nanoparticles

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The developments of complex oxide assemblies, which can be used as biocidal agents, are an interesting alternative to current methods in neutralizing of harmful bacteria. Silver (Ag) and copper (Cu) were observed to have biocidal properties by Carl von Nageli in the late 19th century. The results were evident that the ions not the materials were responsible for cellular death. The phenomenon was given the name of oligodynamia. The mechanism by which cellular death is achieved is not fully understood, however several possible pathways have been theorized. It has been proposed that the lysis of the cell membrane is the principal reason for antibacterial activity. Impairment of the transport activity, denaturation of the proteins and modifications in the bacterial DNA has also been suggested. From the electrostatic forces we postulated that positively charged dextran coated on Ag_2O nanoparticles adhere to gram negative E.coli allowing the Ag_2O the intimate contact needed to achieve the cellular death. The experiment was performed using a E.coli and dextran coated Ag_2O nanoparticles. We introduced 90 µL of E.coli to the nutrient rich agar plates via pipet and proceeded to apply the atomized Ag_2O treatment in different concentrations ranging from 10 $mgmL^{-1}$ to 0.5 $mgmL^{-1}$. The experiment took place in two stages, first control group had an average of 122 colony-forming units (cfu), and the second having a control average of 41 cfu. The results showed a complete eradication of the E. coli at all concentrations.

P13

Probing Mechanical Properties of β-lactoglobulin Fibers Using Atomic Force Microscopy

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Self-assembled nanofibrils from bovine β-lactoglobulin (β-Lg) have recently been the subject of extensive investigations owing to their potential applications in biotechnology, nanoelectronics and biosensors or as food ingredients with modified functionality. At low pH and high temperatures this protein unfolds and self assembles into fibers. The purpose of this study is to investigate the structural and mechanical properties of single β-lactoglobulin fibers using AFM-Quantitative Nanomechanical Mapping (QNM) and AFM-force spectroscopy. The average elastic modulus for the fibers was determined to be 4.3 GPa. Also, an average persistence length of 500 nm was determined by measuring the end to end distance and contour length of 30 isolated fibers. The fibrils analyzed in the present work were found to display mechanical in the same range as that found for the fibril of insulin of 3.3 GPa. This common feature is due to fibrils' sharing a common cross-β structure with hydrogen bonded β strands arranged perpendicular to the fibril axis. Our data shows that the two AFM modes applied here are capable to probe the intrinsic properties of protein fibrils such as their strength and Young's moduli. Understanding the mechanisms of fibrillation, the structural features, and the physical and mechanical properties of these fibrils is an essential step to both unraveling their biological role and also their successful applications in nanotechnology and material science.

P14

Developing a method for detection of weak gravitational waves produced by core collapse supernovae

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Gravitational waves are small changes in space-time produced by massive astrophysical objects that propagate like waves moving with the speed of light. Tremendous efforts have been made by international community of scientists to detect gravitational waves. This goal has been finally achieved by the US Laser Interferometer Gravitational-Wave Observatory (LIGO) which is currently conducting continuous observations of the universe. Among the sources of gravitational waves are binary stellar objects (binary black holes or binary neutron stars), pulsars, supernovae, and the universe itself during its primordial expansion. We are developing a method for detection of gravitational waves produced by core collapse supernovae. Since such signals are weak by nature we are trying to effectively increase the signal-to-noise ratio of the data. To test our algorithm we use simulated injections which contain random Gaussian noise and modeled signals from catalogs of known waveforms. When the trial algorithm is finished we will extend it to include realistic noise from LIGO detectors. Our approach is to utilize the Wiener Noise Suppressor which is based on Decision-Directed method with Temporal Signal-to-Noise Ratio and Harmonic Regeneration Noise Reduction algorithms. Our goal is to improve the probability of detection. The results of this research can be useful for international community of scientists conducting research in the field of gravitational waves.

P15

Tunable Optical Isolation

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It is known that time-reversal symmetry can be broken using space and time modulations. For example, in spatiotemporal modulated waveguides it has been shown that an interband transition from one frequency to another can occur only in one direction which results in optical isolation. Here we will show that this picture is no longer correct at the exceptional point of a spatiotemporally modulated non-Hermitian parity and time-symmetric waveguide. Specifically, we will show that by spatially and temporally modulating the imaginary part of the index of refraction as well as the real part we recover reciprocity. Our proposal can help to introduce a new way to control photon propagation in photonic structure and help in designing sensors bases on non-reciprocity.

P16

Multiferroic $BiMnO_3$ Brushwood- and Plate - Like Structures Produced by Microfluidic Approach

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Multiferroic materials potentially can be used for application in ferroelectric memory devices. It has been demonstrated that $BiMnO_3$ is one of few multiferroic materials displaying both stable ferroelectric and ferromagnetic characteristics. The polycrystalline $BiMnO_3$ bulk samples were prepared using high purity Bi_2O_3 and Mn_2O_3 powders under 60 kbar in a belt-type high-pressure apparatus at 1383 K for 60-70 minutes as described in the literature. In this work $BiMnO_3$ nano structured resembling brushwood-like and plate-like assemblies were successfully produced utilizing microfluidic synthesis approach. The manganese nitrate hexahydrate $Mn(NO_3)_2{\cdot}6H_2O$ combined with bismuth nitrate pentahydrate $Bi(NO_3)_3{\cdot}5H_2O$ were used as a raw components to produce $BiMnO_3$. The raw materials concentration was critical in tuning the particle composition and morphology, while the laminar flow in micro-channels assured the complete structures without breakage. Three trials consisting of the same procedure were conducted, with

variation of flow setting of the salt solutions on the microfluidic pump. For the first trial the speed was set at 20 rpm for all solutions. For trial 2 the salts were set at 15 rpm and NaOH was left at 20 rpm, and for trial 3 the salts were set at 10 rpm and NaOH left at 20 rpm. Products obtained had a coloration ranging from pale to light yellow. The products were washed by centrifuge five times and then dried. The powder was further grounded and analyzed with Differential Scanning Calorimetry (DSC), X-ray diffraction analysis (XRD) and Scanning Electron Microscopy (SEM) including Energy-dispersive X-ray spectroscopy (EDX). Imaging obtained through SEM and EDX displayed brushwood-like and plate-like shaped crystals indicating the presence of $BiMnO_3$. The XRD pattern has clearly revealed single phase monoclinic structure which is identical to earlier reports. We would like to acknowledge the financial support of this research by the NSF PREM (award DMR-1523577: UTRGV-UMN Partnership for Fostering Innovation by Bridging Excellence in Research and Student Success).

P17

Parity-Time Symmetric Adiabatic Elimination

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Recently, the interest in designing optical structures with Parity-Time (PT) symmetry has been increased due to their peculiar features. All PT-symmetric optical systems contain some gain and loss mechanisms distributed judiciously in the system such that the Hamiltonian of the system in the so-called exact phase with real eigenvalues commutes with the parity-time operator. It would be of great interest to develop a PT structure in which the gain and loss elements are separated by a passive element and yet it depicts the same dynamics as the PT structure with gain and loss elements being directly coupled. In this work, we investigate the influence of parity-time symmetry on adiabatic elimination in three coupled waveguides. To determine whether the adiabatic elimination holds and how the dynamics is affected by non-Hermiticity, we investigate the beam dynamics in the exact and broken phase. In adiabatic elimination, one sets the parameters of a system such that one of the components of the system, here the dark state, becomes neutral and has almost no influence on the dynamics of the system. If adiabatic elimination holds, we expect that the excitation in the loss waveguide, when we excite it initially, couples to the gain waveguide whilst the intensity of the electric field in the middle one remains almost zero. Therefore, the dark state intensity in adiabatic elimination regime remains constant while the overall dynamics is affected by the gain and loss. However, when the system enters the broken phase, the intensity of the electric field in all waveguides increases exponentially. The exponential growth of the total intensity of the electric field is a consequence of the exponentially growing eigenmode which has components in all three waveguides. Therefore, adiabatic elimination does not hold in the broken phase and it only holds in the exact phase.

Chemistry

P18

Development of Glutamyl-tRNA Synthetase from Pseudomonas aeruginosa as a Platform to Screen for Inhibitors of Protein Synthesis

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Pseudomonas aeruginosa is a gram-negative bacteria which causes nosocomial infections and is becoming increasingly antibiotic resistant. Bacterial protein synthesis is a validated target in the development of new compounds as potential new antibiotics. Aminoacyl-tRNA synthetases (aaRSs) catalyze the covalent attachment of amino acids to their cognate tRNAs and are essential for protein synthesis in bacteria. *P. aeruginosa*

glutamyl-tRNA synthetase (GluRS) was overexpressed in *E. coli* cells, and purified to homogeneity. The kinetic parameters for interaction with tRNA were determined and the K_{kat} and K_m were 0.8 sec^{-1} and 0.68 μM, respectively, resulting in a k^{cat}/K_M value of 1.18 $s^{-1}\mu M^{-1}$. Scintillation proximity assay (SPA) technology was adapted to the aminoacylation assay and then used to screen for inhibitors of activity of P. aeruginosa GluRS in a high throughput format. Using this assay, the ChemDiv Soluble Diversity Library (2,800 compounds) was screened to detect compounds with the ability to inhibit function of the enzyme. Seventeen compounds with inhibitory activity were identified and confirmed. Conclusion: GluRS identified in *P. aeruginosa* was cloned, expressed, characterized and developed into a screening platform to identify compounds that have the potential for development as antibacterial agents against drug resistant pathogenic organisms.

P19

Student Perceptions on Chemistry Pre-Laboratory Activities

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The purpose of this research was to gather student perceptions of Chemistry pre-laboratory assignments to improve student lab experience. This study used Qualtrics software to develop a survey which was distributed to students taking General Chemistry II. The survey was divided into three parts: demographics, current pre-laboratory activities, and future pre-lab activities. The four main pre-laboratory assignments studied were writing lab journals, watching videos/presentations, taking in-class quizzes, and taking online quizzes. The survey included both quantitative and qualitative results in which students rated the statements on a scale from strongly disagree to strongly agree and provided explanations and suggestions for improvement. The results of the survey found that students highly preferred watching videos/presentations followed by writing journals even though both activities were reported to be time-consuming. Both forms of quizzes were rated lower, with a preference toward online quizzes as they were seen as more convenient whereas in-class quizzes were seen as more stressful, yet beneficial in terms of knowledge gained. Based on these results, it is recommended that videos and presentations be provided to allow students to learn the information and use graded online quizzes as a practice and for in-class quizzes to assess student understanding of the lab.

P20

Expedient 'on water' chemoselective green synthesis of 4-aminocoumarin bearing chromeno[4,3-b]quinolin-6-ones

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Coumarin (benzopyran-2-one) derivatives are widespread in nature. This oxyheterocyclic scaffold is present in several pharmacologically active molecules, both synthetic and natural. Although the chemistry and biology of coumarin derivatives have been broadly explored but the synthesis of 4-aminocoumarin bearing chromeno[4,3-b]quinolin-6-ones has not been extensively investigated, in particular, when sustainability is related to the synthesis. As a part of our ongoing research related to green methodology development, a microwave-assisted 'on water' protocol to synthesize 4-aminocoumarin bearing chromeno[4,3-b]quinolin-6-ones has recently been developed. Initially, 4-aminocoumarin was synthesized from 4-hydroxycoumarin reacting with ammonium acetate under microwave irradiation (neat). In the subsequent step, 'on water' reaction of 4-aminocoumarin with o-fluorobenzaldehyde under controlled microwave exposure produced the target molecule with the elimination of hydrogen fluoride. No hazardous solvent/catalyst/solid support was used to accomplish the reaction. Clean reaction technique, shorter reaction period, easy work-up procedure, high yield of the product and retention of atom-economy are important aspects of this green synthetic method.

P21

Removal of Chromium(VI) and Chromium(III) ions from aqueous solution using bio-char generated from agricultural waste products

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Heavy metals are one of the most persistent and prevalent contaminates in the aquatic environment. Heavy metals such as chromium are known to causes many different diseases including various forms of cancer. The removal of chromium from aqueous solution, especially in the hexavalent form is difficult. New technologies, techniques and/or new materials have to design to effectively and efficiently remove chromium from the aqueous environment. The current project focuses studying the effects of pH, time, temperature, binding capacity on biochar' generated from agricultural waste produces, in this case pineapple waste. Pineapple skins were dried, ground, and sieved to pass through a 125 µm sieve. The ground pineapple skins were pyrolyzed to produce a biochar material. The biochar was analyzed using FTIR from the data was collected from 600 to 4000 cm^{-1} and SEM/EDS was used to help characterize the potential functional groups on the biochar. The batch pH binding study showed the binding of Cr(VI) bound optimally at lower pHs. The maximum binding pH Cr(VI) bound occurred at pH 2. The binding of the Cr(VI) ions was found to follow the Langmuir isotherm with a binding capacity of 4.35 mg/g. Whereas Cr(III) was found to bind optimally at pH 4 with and binding capacity of 6.44 mg/g at room temperature. In addition, thermodynamic and kinetic data analysis was performed to aid in describing the binding process of Cr(III) and Cr(VI) to the biochar.

P22

Chemical Investigation of the Alcoholic Extract of Magnolia Grandiflora Green Seed Cones

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Magnolia grandiflora is a common plant native to the southeastern United States. It has been used as decoration item, but the plant has many chemical properties previously unknown to science. The Magnolia grandiflora and its seeds can serve as a rich source of medicinal compounds for pharmaceutical companies. We have been carrying out phytochemical investigation of the alcoholic extract of *Magnolia grandiflora* green seed cones. Using column chromatography, and subsequent thin-layer chromatography, the medicinal compounds located in the plant can be separated and ultimately be isolated in pure form either by crystallization and/or preparative TLC. A few compounds have been isolated, and as of now, remain unknown because they have yet to be sent to appropriate laboratories for further testing/confirmation. These compounds can be of interest to pharmaceutical companies, as their overall structure mimics those of known medicinal compounds. The investigation is still on going, but further developed results should be on their way.

P23

Sustainable synthesis of 1,3-thiazolidin-4-ones and benzothiazepinones under controlled dielectric heating

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Since mid-eighties of the past century, a huge number of microwave-assisted organic/organometallic/inorganic transformations have been published with a growing number in every year. It is well known that microwave directly heats the reaction mixture without heating the glass wall of the reaction vessel. Thus the 'local heating' is avoided in microwave-induced chemical synthesis. By the use of microwave-assisted irradiation

technology the formation of the unwanted byproducts (wastes) is reduced/stopped and the desired product is obtained in high yield. Because of several advantages, the use of microwave to achieve various chemical transformations is considered as green technology (green technique). In our laboratory, we have developed a simple, rapid, and scalable green method to synthesize 1,3-thiazolidin-4-ones and benzothiazepinones from diversely substituted mono- and polycyclic amines, aldehydes and thioglycolic acid. No solvent/catalyst/support/additive/promoter was required to accomplish the reaction. Mechanistic investigation revealed that the reaction could follow both the ways: (i) condensation of the thioglycolic acid to the imine and (ii) condensation of an aldehyde to the amide derived from thioglycolic acid and the amine. Although both the routes have been proved to be effective, the later produced higher yield. An outline of our current investigation will be presented.

P24

Effects on alternating the concentration of the bases and temperature in Suzuki Cross Coupling reactions

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Suzuki cross coupling is a reaction in which the catalyst of choice is almost invariably a palladium complex. Over the last few decades, Suzuki coupling has become a common process for the synthesis of intermediates in pharmaceutical and industrial applications. It is well known that palladium is an effective catalyst for the formation of cross-coupled products. Therefore, a palladium(II) chloride catalyst was tested for Suzuki corss coupling reactions using microwave assisted synthesis in alcohol solutions. In addition, the effect of two bases were investigated (NaOH and Na_2CO_3) for the coupling of boronic acid with various substituted phenyl-bromides. The reactants consisted of phenylboronic acid at a constant concentration of 1 mMol and of either 4-bromoanisole, bromotoluene, bromobenzene, or 4-bromochlorobenzene. All reactions favored formation of the cross-coupled products. The reactions were performed using a CEM discover microwave at temperatures of 40˚C, 50˚C, 60˚C, and 70˚C in 5mL propanol. Characterization of reactions and reaction products were performed a combination of gas chromatography with flame ionization detector (GC-FID) and gas chromatography mass spectroscopy (GC-MS) to identify and quantify cross and homo coupled products.

P25

CHARACTERIZATION & MORPHOLOGICAL CONTROL OF NEWLY SYNTHESIZED BORON BASED DELAFOSSITE NANOPARTICLES

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USDA HSI Collaboration: Integrating Food Science/Engineering and Education Network (IFSEEN)

Delafossite nanomaterials have been studied intensely for over a decade and are known for their optical, electrical properties as well as their cost-efficient abundancy as the natural $CuMO_2$ (M= Cr, Co, Fe, B, Al, Ga, or In) configuration. However, the $CuBO_2$ delafossite composition has been recently discovered to have the best band gap within all the semiconducting delafossite to be discovered, due to its compact ionic radius. $CuBO_2$ delafossites were prepared via a low-temperature facile hydrothermal synthesis at 200°C for an hour. The crystal structure, morphology, oxidation states, electron configuration and electrical properties were analyzed using X-ray Diffraction, Scanning electron microscopy, X-ray photoelectron microscopy and cyclic voltammetry (CV). $CuBO_2$ delafossite nanoparticles (NP's) were obtained at measurements of 100 nm and

less. A quick and simple modification was used during the synthesis of $CuBO_2$, a surfactant (Sodium Dodecyl Sulfate) was introduced to alter the morphology of the original delafossite NP's. Various concentrations (10, 15, 20, 40 mmol) of SDS were introduced to the copper borate delafossites, which affected the morphology and decreased particle size. The decreased particle size improved the electro catalytic activity due to the decreased surface area of the NP's. The CV data of the $CuBO_2$ delafossite NP's were more accurately explained with the consideration of lesser concentrations of SDS for the electronic conductivity in alkaline medium (1 M KOH). These materials will be used for OER (oxygen evolution reaction) and HER (hydrogen evolution reaction) applications for potential uses of water splitting due to the photoelectric catalytic efficiency.

P26

Chromium(III) and Chromium(VI) removal from Aqueous solution using K2Mn4O9 under light conditions

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A rancieite ($K_2Mn_4O_9$), nanomaterial was synthesized and studied for the removal of both trivalent and hexavalent chromium from solution under light conditions. The effects of pH on chromium (III) and chromium (VI) were studied to determine the optimal binding pH, which were both found to be at 2. Isotherm studies were performed at temperatures of 20˚C, 40˚C, and 60˚C for chromium (III) and chromium (VI) with binding capacities of 4.629, 1.827, and 0.79 mg/g for Cr(III) and 3.95, 2.26, and 1.08 mg/g for Cr(VI) at the respective temperatures. The thermodynamic parameters showed that the binding processes for the reactions were spontaneous and exothermic in which the ΔH was -26.12 kJ/mol for chromium (VI) and -34.45 kJ/mol for chromium (III). The free energy of adsorption for the chromium (III) were determined to be -3.57 kJ/mol, -1.56 kJ/mol and 0.64 kJ/mol at the afore mentioned temperatures, and chromium (VI) -3.35 kJ/mol, -2.08 kJ/mol, and -0.22 kJ/mol at the respective temperature. The free energy data indicate that the reaction was spontaneous or at equilibrium at all temperatures. Furthermore, the enthalpy values were determined to be -77.42 kJ/mol for chromium (VI) and -105.28 kJ/mol for chromium (III) indicating that the reaction occurred through chemisorption.

P27

Synthesis of TADDOL-Derived Ligands for Palladium Catalyst

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This project focuses on the cost effective systematic development of TADDOL based ligands for palladium catalysts. These types of catalysts are of special interest due to their enantiomeric selectivity but their mechanistic pathway is not yet known. Although there are procedures that can be found in the literature, these have proven unsatisfactory for the purpose of smaller scale synthesis. Synthesizing the ligands involves a three-part procedure. The first step is syntheses of the secondary amines, which allows for the systematic customization of the ligand. This is due to the ability of the pyridyl ring and the amine group to take on various substituents. The second part is the synthesis of a chiral diester from tartaric acid and acetone. The chiral diester is then reacted with a Grignard reagent in order to form TADDOL. The third part of the synthesis is the reaction of the TADDOL, PCl3 and the secondary amine to yield the ligand. The highly customizable aspect of these ligands will allow us to form palladium based catalysts with systematic variations at only one position. The ultimate goal being to form X-ray quality single crystals of these catalysts for the purpose of finding out their 3D structures and performing kinetic studies in order to learn more about their reaction mechanism.

P28

Synthesis and Catalytic Activity of NiMoS2 in the Removal of Dibenzothiophene from Model Fuels

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$NiMoS_2$ catalysts was synthesized using a combination of $Ni(NO_3)_2$, $(NH_4)_6Mo_7O_{24}{\cdot}4H_2O$, and elemental sulfur. The compound was synthesized using a reflux method with 28 % Ammonium hydroxide as the solvent. After 4 hours of reflux the sample was filtered, washed and air- dried. The precursor was tested for phase an structure using X-ray powder diffraction and show the precursor was combination of NiMoO4 and elemental sulfur. The dried sample was decomposed at 450 °C under a $Ar:H_2$(95:5) atmosphere. The decomposed product was determined to be a combination of two crystal phases Ni_3S_4 and MoS_2 using powder X-ray diffraction. The catalysis was synthesized using different mole ratios of Ni:Mo 0.5:1 and 0.25:1. The synthesized catalysts were tested for the ability to removed dibenzothiophene from decahydronapthalene. The results show the removal range from 50 to 90% of the DBT in solution as determined using GC-MS. The tested catalytic activities were 10.6 and 16.7 mol/g s for the 0.25:1 and 0.5:1 Ni:Mo catalysts, respectively. In addition, the catalytic reaction for the removal of HDS from decahydronapthalene showed the catalyst went through hydrogenation route (indirect pathway), showing high amounts of tetrahydro-dibenzothiophene, cyclohexylbenzyl, and bicyclohexyl.

P29

Adsorption of Chromium (III) & (VI) via Amino modified Biochar

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Chromium (VI) metal compounds are used in a large variety of industrial processes that leach out the corresponding ion into water supplies. In the hexavalent form, chromium ions are readily soluble within water, with heightened levels of ingestion leading to carcinogenic complications. Biochar, derived from thermally decomposed pineapple skins was chemically modified to increase the amino functional groups present on the surface. A series of batch studies including: pH, time, and isotherm studies, were performed to test the binding ability of the modified adsorbent. The amino biochar was characterized using an ATR-FTIR (Perkin Elmer Frontier) and SEM/ EDS analysis. The ATR data showed an increase in both the amino functional groups, as well as sulfur-oxygen functional groups. Both chromium (III) and (VI) ions bound to the amino modified biochar with maximum binding observed at pH 4 and pH 2, respectively. Time dependence studies revealed binding occurred within the first five minutes of contact and remained constant over the studied time. Isotherm data was fitted using the Langmuir model. The chemically modified biochar had a binding capacity of 46.512 mg/g to chromium (VI) (pH 2), while chromium (III) had a capacity of 27.10 mg/g (pH 4). Thermodynamics showed a mildly spontaneous process of adsorption for chromium (III) with corresponding ΔG of -0.1699 kJ/mol. Whereas chromium(VI) showed a non-spontaneous process with ΔG energy of approximately 2.251 kJ/mol.

P30

Fine-Tune Crystal Size and Phase Transition of $La_2Zr_2O_7$ Nanoparticles via Molten Salt Procedure

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Lanthanum zirconate is known for its potentials as good thermal barrier coating and high efficiency catalysis due to its high thermal stability and structural flexibility. This compound has two phases: disorder fluorite and ordered pyrochlore. $La_2Zr_2O_7$ nanoparticles (NPs) can be produced by a variety of synthesis methods while the molten

salt synthesis method is particularly attractive due to its low synthesis temperature, low cost, and ease of implementation. In this study, we studied the influence of the different molten salt processing parameters, i.e. nitrate vs. chloride, and processing temperature and duration, on the crystal size and phase of the pre-formed $La_2Zr_2O_7$ NPs. A suite of characterization techniques, including X-ray diffraction, Raman spectroscopy, scanning electron microscopy, and photoluminescence, were employed to investigate the crystal structure and size evolution of these nanoparticles.

P31

Green synthesis of 5-methyl-thiazolidin-4-ones

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Protection of our environment is one of the major criteria in modern chemical synthesis, in both academia and industry. As a continuation of our ongoing research to synthesize pharmacologically relevant heterocyclic moieties; an expeditious, green, and scalable methodology to synthesize 5-methyl-thiazolidin-4-ones has been developed. Today, heterocycles are amongst the most well recognized molecules utilized in drugs, hormones, vitamins, and essential medical substances. No catalyst/solvent/promoter/additive/support has been used to achieve the target compound in excellent yield. An equimolar mixture of amine, aldehyde, and 2-mercaptopropanoic acid were irradiated under controlled microwave exposure to accomplish the reaction. No extraction was needed for the reaction. Easy reaction procedure, shorter reaction period, high yield of the product and retention of atom-economy are important aspects of this green synthetic method.

P32

Synthesis and optical/scintillating properties of lanthanum zirconate nanoparticles and transparent ceramics

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One major component of these detectors is a scintillation material. In order to detect at high-energy frequencies, detectors utilize scintillator materials to absorb high energy photons and emit a larger number of lower energy photons to which the detector is more sensitive. Apart from large and inflexible single crystals which are notoriously finicky and expensive to produce with limited resolution, new-generation scintillators can be made of nanocomposites and ceramics. However, traditional methods for composite synthesis yield large aggregates and inhomogeneities, while retaining a high polymer fraction, rendering them unsuitable for device manufacture. Improving the efficiency and cost of these traditional scintillators is an active area of research. A promising method for this includes the creation of transparent ceramics from nanoparticles. In this study, we are synthesizing lanthanum zirconate scintillating nanoparticles through a combined co-precipitation by ammonium or urea and molten-salt synthesis procedure. Lanthanum zirconate nanoparticles were characterized through XRD to confirm their pure phase with particle size of about 23 nanometers and a lattice parameter of 10.85 Angstroms. Their morphology has been checked with SEM and composition was confirmed by EDAX. These nanoparticles will be fabricated into free standing transparent ceramic pellets by sintering after cold press. For future applications, the optical and scintillating properties of these nanoparticles and ceramics will be tested and proven to be beneficial in detecting radiation.

P33

Synthesis of Pd-TADDOL Based Catalysts

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TADDOL (α,α,α,α-tetraaryl-1,3-dioxolane-4,5- dimethanols)–derived phosphoramadite ligands have been extensively used in metal-ligand asymmetric catalysis for their efficiency and tunable enantioselectivity. Palladium-TADDOL phosphoramadite complexes have been widely used in allylic alkylations; however, the mechanism underlying these reactions is not certain. The TADDOL phosphoramadite ligand synthesized from *N*-phenyl-*N*-2-pyridylamine has been the focus of our group's investigation for Pd-TADDOL phosphoramadite catalyzed reaction mechanism. We started with the synthesis of ligand precursors: TADDOL and *N*-phenyl-*N*-2-pyridylamine. The addition of (−)-Dimethyl 2,3-O-isopropylidene-L-tartrate in THF to 2-phenylmagensium bromide yielded TADDOL; and, the reaction of aniline with 2-bromopyridine yielded *N*-phenyl-*N*-2-pyridylamine. Both reactions yielded pure products confirmed via TLC and NMR against known literature values. The Pd precursor was synthesized from $PdCl_2$ and allyl chloride to yield allylpalladium(II) chloride dimer. The target ligand is made by reacting PCl_3, TADDOL and *N*-phenyl-*N*-2-pyridylamine in the presence of triethylamine in THF. Ligand derivatives are easily made by modifying the pyridyl substituent of the target catalyst. In addition to the planned kinetic studies to reveal the reaction mechanisms of Pd-phosphoramadite catalyst, we will grow the crystals of TADDOL phosphoramadite ligands and their Pd-complexes to obtain structural information. The structures of this ligand and its derivatives are not known and are essential for understanding their role in catalysis.

P34

Identification of Compounds that Inhibit the Function of Lysyl-tRNA Synthetase from Pseudomonas aeruginosa

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Pseudomonas aeruginosa is an opportunistic pathogen and a primary cause of nosocomial infections. Aminoacyl-tRNA synthetases (aaRSs) are a class of enzymes that catalyze the covalent attachment of amino acids to their cognate tRNAs during protein biosynthesis and are validated targets for development of antibacterial agents. Methods. *P. aeruginosa* lysyl-tRNA synthetase (LysRS) was overexpressed and purified to at least 98% homogeneity. LysRS were kinetically evaluated and a scintillation proximity assays (SPA) was developed to screen chemical compound libraries for inhibitors of activity. Compounds were identified and analyzed for the ability to inhibit *in vitro* activity and growth of bacteria in culture. Aminoacylation assays were used to measure kinetic parameters for interactions with tRNA and ATP:PPi assays were used to monitor the kinetic parameters for interactions with lysine and ATP. The K_m's for *P. aeruginosa* LysRS interaction with its three substrates, lysine, ATP and $tRNA^{Lys}$ were determined to be 45.5, 627, and 3.3 μM, respectively. The V_{max} values were 160, 274 and 0.11 μM min^{-1}, respectively, resulting in an observed k^{cat} of 13.3, 22.8, and 0.35 sec^{-1}. This resulted in k^{cat}/K_M values of 0.29, 0.036, 0.11 $s^{-1}\mu M^{-1}$. Using SPA technology, natural product (800) and synthetic (890) compounds were screened to identify compounds with the ability to inhibit function of the enzyme. Compounds with inhibitory activity were identified and the IC50 was determined for each compound. MICs for compounds with promising IC50 values were determined against a panel of bacteria including; *E.coli*, *E. coli* tolC mutant, *E. faecalis*, *H. influenzae*, *P. aeruginosa*, *P. aeruginosa PAO200* (efflux pump mutant), *P. aeruginosa* hypersensitive strain, *S. aureus*, and *S. pneumonia*. LysRS from *P. aeruginosa* was characterized and developed into a screening platform used to identify compounds that have the potential for development as an antibacterial agent against drug resistant pathogenic organisms.

P35

Inhibition of Androgen Receptor Steroid Binding Activity by the Thyroid Hormone

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The androgen and the estrogen receptors are responsible for the development of male and female characteristics in the body. Chemical compounds with a diphenyl structure have been shown to inhibit the activity of the androgen receptor by inhibiting the binding of the steroid testosterone to the receptor. Some of the compounds that inhibit testosterone binding include the pesticide DDT and the environmental contaminant BPA. In this project we investigated if the thyroid hormone, which also has a diphenyl structure, would inhibit steroid binding to the human androgen receptor. We used a filter binding assay to measure the thyroid hormone inhibition of steroid binding and we found that it does inhibit testosterone binding to the receptor. Interestingly, we found that the inhibitory effect of the thyroid hormone solutions we prepared increased by a factor of five over a period of 30 days. Additional research will be needed to determine how the structure of the thyroid hormone becomes altered in solution over time to increase its inhibitory activity.

P36

Identification of Compounds that Inhibit the Function of Glutaminyl-tRNA Synthetase from Pseudomonas aeruginosa

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Pseudomonas aeruginosa is a major cause of nosocomial infections and the leading cause of mortality in patients with cystic fibrosis. Aminoacyl-tRNA synthetases (aaRS) are targeted in the development of new antibiotics, since their role is indispensable in protein synthesis. Previously, glutaminyl-tRNA synthetase (GlnRS) from *P. aeruginosa* was over expressed and enzymatically characterized for development as a screening platform for discovery of chemical compounds that have the potential for development as anti-bacterials. Scintillation proximity assay (SPA) technology was adapted to the aminoacylation assay and used to screen for inhibitors of activity of *P. aeruginosa* GlnRS in a medium throughput format. Screening of a natural product (800) and two synthetic (2,810) compound libraries resulted in the detection of thirty-eight compounds. Seven compounds (BM02E04, BM03C10, BM04B05, BM04H03, BM06G07, BM07A07, and CD47E08) of these compounds were confirmed for inhibition of the activity of GlnRS. GlnRS from *P. aeruginosa* was developed into a screening platform and used to identify compounds that have the potential for development as an antibacterial agent against drug resistant pathogenic organisms. Research was funded by NIH grant 1SC-3GM098173-01A1.

P37

Phytochemical investigation of the non-polar extract of Tillandsia usneoides

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Nature is a remarkable chemist capable of producing effective reactions in a selective manner. The diversity that exist in nature has allowed for successful discovery and development of a profound number of pharmaceutical drugs. Traditionally, natural products have been widely used for the treatment of disease and illnesses throughout all cultures. Molecules derived from natural products are promising leads in drug research and act as models of chemical synthesis. Plants, in particular, have been a great source for new drug leads because the great diversity in plants provides a multitude of biosynthesis approaches which can be used to derive potential drug candidates. Till now, about 25% commercial drugs are directly obtained from nature and about 61% commer-

cial drugs are either natural or semi-synthetic natural products. A phytochemical investigation of the non-polar extract of Spanish moss (*Tillandsia usneoides*) has been carried out to identify new sources of natural compounds. A cold extraction with diethyl ether was used to separate the compounds from the Spanish moss and the product was then isolated by means of column chromatography using 100% hexane as the eluent. Analysis of the product was conducted using NMR, IR, and HRMS methods. A concise report will be presented.

P38

Structure-Activity Relationship of Novel RGD-Containing Cyclic Peptides Against αvβ3 Integrin

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The αvβ3 integrin is a receptor for many extracellular matrix proteins with the RGD-sequence motif, and is involved in multiple physiological processes of cells including angiogenesis and metastasis. αvβ3 is highly expressed in tumor cells and is therefore a target for cancer therapy. It has been of great interest to develop RGD-containing ligands against the integrin. Two RGD-peptide isomers were recently screened as antagonists with dramatically different binding affinity, but structures are unknown. We present the solution structures of two isomers determined by NMR. Structure analysis reveals they adapt in entirely different conformations, provide new insight into the ligand recognition specificity of integrins, and provide valuable clues for rational design of novel antagonists.

P39

Removal of Cu2+ and Ni2+ from Aqueous Solution Nanoparticles of pH, Time and Temperature

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Tin oxide, SnO2, nanomaterial was used to remove Copper (II) and Nickel (II) from aqueous solutions. The effects of pH on Copper (II) and Nickel (II) were studied to determine the optimal binding pH, which were found to be 5 respectively. Isotherm studies were performed at temperatures of 4˚C, 25˚C, and 45˚C for copper (II) and Nickel (II) with binding capacities of 2.65 mg/g, 3.35 mg/g, 4.74 mg/g for copper (II) 1.14 mg/g, 3.25 mg/g, and 7.95 mg/g for Nickel (II) at the respective temperatures. Thermodynamic parameters showed that the binding processes for the reactions were spontaneous and exothermic in which the ΔH was -18.84 kJ/mol for Cu (III) and -12.45 kJ/mol for Ni (II). The Δs was 55.03 for Cu (II) and -54.71 for Ni (II) the reaction was determined to be temperature dependent. The free energy of adsorption for the Cu (II) were determined to be 13.99 KJ/mol at the temperatures mentioned above, and Ni (II) 8.09 KJ/mol, at the respective temperature. The activation energy data indicate that the reaction was non-spontaneous or at equilibrium at all temperatures.

P40

Synthesis and characterization of Streptomycin and Penicillin G capped silver nanoparticles for the management of the Citrus Huanglongbing Disease

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Citrus Huanglongbing (HLB) has lately emerged as one of the most destructive diseases for citrus trees around the world, and currently is threatening the citrus industry in many American states especially Florida. Until now, there is no clear cure for this devastating bacterial disease. As a promising treatment, this study investigates the ef-

fect of silver nanoparticles functionalized with two different antibiotics: Penicillin G and Streptomycin. First, tannic acid-stabilized silver nanoparticles are prepared by a simple reduction chemical reaction, and the formation of the silver nanoparticles is confirmed by the X-ray diffraction (XRD) and UV-Vis spectroscopy. Streptomycin is conjugated with these particles immediately with simple mixing. To conjugate the Penicillin G, free amine groups had to be introduced on the surface of silver nanoparticles by coating a uniform layer of polyaniline, which is confirmed by FT-IR spectroscopy and transmission electron microscopy (TEM). The Penicillin G attached to these particles depending on the reaction between the amine groups of the Aniline and the carboxyl groups in the Penicillin G. These functionalized nanoparticles will be delivered to the infected citrus trees at APHIS using the vector of the HLB, the Asian citrus psyllid (*Diaphorina citri*), as a carrier, which may provide a more efficient way for the management of the HLB and other bacterial plant diseases.

P41

Speciation of actinides in La2Hf2O7 pyrochlores: A case study with Uranium

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Speciation studies of actinides in pyrochlore hosts would give a scientific insight for their exploration as a nuclear waste host, as it would provide important information about the solubility and leaching behaviour of the material. In this work for the first time Uranium speciation studies have been carried out on La2Hf2O7 nanoparticles. $La_2Hf_2O_7$:Ux% nanoparticles (x= 0.5, 1, 2.5, 5, 7.5, and 10) has been synthesized using the molten salt synthesis (MSS) method and has been characterized systematically using various techniques. X-ray photoelectron and luminescence spectroscopy confirms the stabilization of uranium as both U^{4+} and U^{6+} oxidation state in $La_2Hf_2O_7$nanoparticles. Emission spectroscopy further confirms the existence of U^{+6} in octahedral uranate UO_6^{6-} form. Lifetime spectroscopy suggested the stabilization of U+4 at Hf4+ site with lifetime of around 1.0 µs and U^{+6} at La^{3+} site with lifetime value around 9.0 µs. Concentration dependent study shows that the proportion of U^{4+} was found to be greater than U^{6+} at lower doping level but at higher doping level beyond 2.5% the fraction of U^{6+} in $La_2Hf_2O_7$ nanoparticles was found to be greater than U^{4+}. Such optical variation was successfully explained using Raman spectroscopy that clearly showed structural phase transition from order pyrochlore to cotunnite at higher uranium doping. Order pyrochlore phase favour U^{4+} whereas disordered cotunnite phase favoured UO_6^{6-}. This work is not only important from nuclear industry perspective but will open up a new avenue for research areas such as fundamental solid state spectroscopy of uranium, doping induced pyrochlore to fluorite phase transition and structure-optical property correlation for doped $A_2B_2O_7$ composition.

P42

Recombinant expression and purification of Pseudomonas aeruginosa initiation factor IF-3 for structural studies

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Pseudomonas aeruginosa is an opportunistic bacterial pathogen and a primary cause of nosocomial infection in humans. Treatment for P. aeru*ginosa* infections has proven to be difficult because of its rapid development of antibiotic resistance. The increasing worldwide antibiotic resistance of *P. aeruginosa* has created the unmet need of discovery of novel and effective antibiotics. Bacterial protein synthesis is an essential metabol-

ic process and a validated target for the development of antibiotics. The recent efforts in the lab this research was conducted in have been on understanding the structure and molecular mechanism of translation initiation factors involved in *P. aeruginosa* protein synthesis, as three-dimensional structure of Pa-IF1- one of these protein factors from *P. aeruginosa* has been determined. The goal of this project is to determine three-dimensional structure of Pa-IF3. IF3 functions to facilitate the binding of the 30S ribosomal subunit to the mRNA for translation initiation during protein synthesis. The structural studies on Pa-IF3 will provide a source for the understanding of IFs initiated protein synthesis machinery and structural insight onto structure-guided rational design of small molecular inhibitors for the development of new and effective antibiotics.

P43

Development of polydiacetylene-embedded nanofibers for assessing food spoilage

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Due to health and economic concerns, increasing attention has been attracted to the safety and quality control of food, particularly meat and seafood. Ammonia and biogenic amines (BAs), such as trimethylamine, putrescine, and cadaverine, are released during the decomposition of meat protein, therefore the sensitive detection of the released BAs is crucial to the assessment of the safety and quality of meat products during storage, transportation and consumption. Changes in optical, electrochemical, conducting, and chromic properties of sensor matrices engendered upon exposure to the vapor of released BAs could serve as output signals. Conjugated polymers have been broadly explored as colorimetric sensing materials due to their attractive optical and electrical properties. These properties primarily result from an extensive delocalized π-system and intrinsic conformational restrictions within the polymer chain. Among the conjugated polymers reported to date, polydiacetylene (PDA) is of particular interest because they can change color from blue to red in response to external stimuli. In this study, silica-reinforced PDA nanofiber mat was developed by a novel ForceSpinning technique. The nanofibers were characterized with SEM, FTIR and photoluminescence. The nanofibers were then exposed to BA vapors from degrading food. The PDA fibers responded to the degrading foods as a colorimetric sensor. Overall, the developed PDA nanofibers are able to detect the food degrading using the amine vapors being released from spoiling food and are suitable for the real-time and in situ monitoring and assessment of the deterioration of meat freshness.

P44

Ultrasound-assisted expeditious green synthesis of Pyrano[2,3-c]pyrazoles

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Pyranopyrazoles are fused heterocyclic compounds that possess many bioactive properties such as fungicidal, bactericidal, vasodilatory activities and act as anticancer agents as well as excellent inhibitor for human ChK1 kinase. They also find application as pharmaceutical ingredients and biodegradable agrochemicals. Based on their multifaceted properties, considerable attention has been focused on the development of new methodologies for the synthesis of this medicinally privileged pharmacophore. Ultrasound-assisted, organocatalyzed greener method has been developed to synthesize diversely substituted pyrano[2,3-c]pyrazole derivatives. A series of solvents and green organic bases were screened to optimize the solvent and catalyst for the procedure. Hünig's base (*N,N*-Diisopropylethylamine, or DIPEA) was identified as the best catalyst and ethyl acetate as the best solvent to produce the highest yield of the prod-

uct. Thus far, the project has currently passed the optimization phase—which consisted of choosing the ideal parameters for further reactions—those that have the highest yield of product. Phase I consisted of choosing which method of synthesizing was the most effective: sonication at differing temperatures or the control, which was stirring at room temperature. Phase II consisted of diversely substituted synthesis of a series of pyranopyrazoles. The newly developed methodology satisfies many aspects of green chemistry that is targeted to environmental protection. Clean reaction technique, preservation of atom-economy, shorter reaction period, easy isolation procedure are notable features of this sustainable method.

P45

Docking Study of DDT and Analogues on Surface Binding Sites of the Estrogen and Androgen Receptors

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The androgen receptor (AR) and estrogen receptor (ER) are steroid receptors and members a nuclear receptor superfamily. Dysregulation may lead to cancer or other developmental problems. The AR and ER ligand binding domains (LBDs) include two surface allosteric binding sites: activation function-2 (AF-2), where co-factors regulating transcription bind, and binding function-3 (BF-3), a regulatory site important for receptor activity. Studies showed compounds could bind in BF-3 and inhibit co-activator binding to AF-2. Additional studies showed that Endocrine Disrupting Chemicals (EDCs) could induce steroid release from the orthosteric-binding site. We investigate here how EDCs bind to AR and ER, disrupting their function. DDT and three DDT analogs (DDE, DDD, mitotane) were docked onto the human AR and ER surface binding sites using the Induced Fit docking protocol. The resulting ligand-receptor complexes were clustered and representative complexes were analyzed. Results show better correlation with BF-3 docks as compared to the AF-2 binding site docks. From the residues with strong EDC interaction energy, N833, F673, and P723 were common to all EDC/AR BF-3 complexes while K481, V478, M315, and P365 were found in the EDC/ER BF-3 complexes and were inferred to be important for ligand binding. Residues which displayed a higher interaction energy with EDCs in the AR AF-2 are M734, I898, Q738, M894, while the residues for the ER AF-2 are V376, M543, I358, L379. Residues with interaction energy lower than -2.0 kcal/mol were considered to have significant interactions with the ligand. Some important residues have been observed to be in topologically equivalent locations between the AR and ER for both surface LBDs. Mutations are being performed to confirm the significance of these residues in EDC binding.

Biology

P46

Community Engagement, Recognition, and Prevention of Chagas Disease and the Kissing Bug in the Lower Rio Grande Valley

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Chagas disease, caused by the protozoan Trypanosoma cruzi, kills thousands of people every year. T. cruzi is among the leading infectious diseases in the Americas' and is the dominant cause of infectious myocarditis worldwide. Kissing bugs are the vectors that carry *T. cruzi*. and can be found in the Lower Rio Grande Valley (LRGV). There is no vaccine for this disease. The best mechanism to prevent/control this disease is to control kissing bug infestations; yet, very little is known about the level of understanding local communities have about this disease. Our goal was to test the knowledge of several communities in collaboration with La Union del Pueblo Unido (LUPE) in the LRGV on

Chagas disease and its vector. Our working hypothesis is that local communities do not have information about this disease and its vector. Surveys were administered at community centers across the LRGV from January to March and were analyzed using IBM SPSS Statistics software. Preliminary results demonstrated < 5% of participants knowledgeable of the disease and/or vector. There was no significant correlation between knowledge and age/location/ethnicity/level of education. Post-survey presentations were delivered regarding awareness and prevention of Chagas disease. Beneficial information regarding prevention is key to reducing the transmission and spread of the disease. Furthermore, potential interest by city/county/state health officials may also be a benefit of this research project to ensure proper educational programs for the LRGV and adequate pest control in communities residing in the LRGV. Our efforts to educate people about this disease will include more local community collaborations since HOPE and La UNION began, both of which are critical centers that work with local communities in the LRGV.

P47

Comparative Transcriptome Analysis of Aquatic Insects to Understand the Evolution of Chemoreceptor Genes

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Chemoreceptor genes can provide survival skills of certain insect species. They are known to be involved in the evolution of the nervous system. To have a better understanding on the evolution of chemoreceptor genes, we are comparing the transcriptome comparison between the transcriptomes of three aquatic insects: Dragonfly (Tramea onusta), Mayfly (Hexagenia limbata), and Stonefly (Zealeuctra arnoldi). We are looking at the six chemoreceptor genes group such as Odorant-binding proteins (OBP), Chemosensory proteins (CSP), Odorant receptors (OR), Gustatory receptors (GR), Ionotropic receptors (IR), sensory neuron membrane proteins (SNMP), Odorant-degrading enzymes (ODE), and Ionotropic Glutamate Receptor (IGR). We have found various copies of chemoreceptor genes in these three-aquatic species with 36 in Dragonfly, 59 in Mayfly, and 38 in Stoneflies. Transcriptome data indicated 10 OBPs, 15 CSPs, 6 IRs, 1 SNMPs, and 7 IGRs for Stoneflies; 1 OBPs, 8 CSPs, 3 IRs, 1 SNMPs, and 13 IGRs for Dragonfly; 12 OBPs, 13 CSPs, 2 ORs, 3 IRs, 1 SNMPs, and 12 IGRs for Mayfly. We will analyze the genes using phylogeny and gene expression analyses. We expect to provide a greater understanding of the chemoreceptors in the aquatic insect.

P48

The Effects of the Combined Use of Ibuprofen and Ethanol on Cell Death of Serotonergic Neuronal SH-SY5Y Cells

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Ibuprofen is an over-the counter (OTC) non-selective nonsteroidal anti-inflammatory drug (NSAID), used to treat both chronic and acute pain. Many studies have shown its adverse long-term effects on the liver and kidney, especially in combination with ethanol (E). We hypothesized that chronic NSAID use had similar effects on the brain by exhibiting oxidative stress and cell death in sensitive brain regions. The study aims to determine the effect of Ibuprofen, combined with physiologically relevant doses of ethanol on human neuroblastoma SH-SY5Y cells, which mimic serotonergic neurons of the hippocampus, a region in the brain responsible for emotions and long term memory. Human SH-SY5Y cells were cultured and exposed to varying doses of Ibuprofen (20-500 μM) and treated in the absence or presence of low (10mM) or high (88mM) concentrations of E for 24 hrs. MTT assays were used to determine cell viability. Fluoro-

metry was used with DCFDA, a free radical marker, for determination of cellular oxidative stress levels. Protein expression of PARP and caspase-3, cell death markers, were detected using Western blots. Cells treated with low or high doses of E exhibited no significant change in viability relative to untreated controls, but there was a significant dose-dependent loss in cell viability, with 100μM Ibuprofen causing death of 40% of the cells. The combination of E and Ibuprofen increased oxidative stress, and a dramatic increase in PARP cleavage and caspase-3 was observed. Our results indicate that at 100 μM or higher concentration of Ibuprofen alone causes cell death. The combination Ibuprofen with ethanol significantly augments neuronal cell death. Together, these results suggest that chronic and combined exposure to Ibuprofen and ethanol can potentially lead to a loss of serotonergic neurons.

P49

Establishment of a co-culture system to recreate the cone visual cycle in vitro

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Cone photoreceptors are found in the retina and they support our ability to see in the daytime, functioning under bright and alternating light conditions. Studies from past decades have identified a cone specific retinal visual cycle in which Muller cells mediate efficient pigment regeneration by supplying chromophore required for cone photoreceptor function in bright light. We know that the cone visual cycle involves an interaction between Muller and cone photoreceptor cells however the molecular mechanisms between these cells remains largely unknown. The purpose of this study is to establish a 3-D system that recapitulates the anatomical and physiological structure and function of the human retina to recreate the cone visual cycle, *in vitro*, using co-culturing techniques. The importance of this study is an innovative approach to better understand the interactions between cone photoreceptor and Muller cells as well as the opportunity to measure the effects that imposed conditions have on the cone visual cycle *in vitro*. Potentially, it could be used to diagnose and treat retinal diseases. 661W mouse cone photoreceptor cells and MIO-M1 Muller human glial cells were co-cultured using DMEM with 10 % FBS in a humidified 5% CO2 environment at 37˚C. Cell viability was measured after 24 hours using the trypan blue exclusion method. Cell viability in MIO-M1 Muller cells increased by 72% after 24 hours from 85K to 146K, reaching 80% confluence in the lower compartment of transwell plates. In contrast, 661W cone photoreceptor cells, cultured in the upper compartment, reached confluence after 24 hours with a cell viability measuring at 111K, a decrease from the seeded 250K cells. Based on our results, the co-culturing methods were successful. After 24 hours the cone photoreceptor cells were confluent and Muller glial cells reached 80% confluence as well as demonstrated a significant increase in cell viability.

P50

Investigating the efficacy of JAK/STAT3 inhibition as a cancer therapeutic

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JAK tyrosine kinase becomes activated upon ligand binding and phosphorylates STAT transcription factors. Phosphorylated STAT3 will then become nuclear and activate key target genes. The Keniry lab has found that pluripotency genes such as *OCT4*, *SOX2*, and *NANOG* of the JAK/STAT3 pathway were induced by exogenous FOXO3 in a U87MG cell line. Indeed, FOXO3 was required to maintain normal levels of phosphorylated STAT3. This lead us to test wether JAK inhibition would be an efficacious therapy for cancers that have nuclear FOXO. STAT3 was known to become constitutively active in various human cancers, aiding their survival. We aim to figure out if a JAK inhibition will hinder growth and survival of U87MG cells by blocking its phosphorylation and

nuclear access. These findings can be critical in the improvement of a therapeutic approach in this specific cancer setting.

P51

A preliminary molecular phylogeny of the Eastern US Oxyloma (Gastropoda: Succineidae)

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Invertebrates comprise 99% of all animal diversity but are often overlooked. Gaps in the literature demonstrate Succineidae, a family of terrestrial gastropods known as "amber snails," has been infrequently investigated in North America. The succineid genus Oxyloma found throughout Canada and the United States contains approximately 16 described species, whose sole criterion, shell morphology, for differentiation has proven unreliable. As a first step towards understanding the evolutionary history and revising the taxonomy of North American *Oxyloma*, we have sampled the four eastern species (*O. salleana, O. subeffusa, O. effusa, and O. retusa*) from their respective type localities and compared their mitochondrial COI sequences with samples found across their range. A preliminary molecular phylogeny based on mitochondrial data does not find the four nominal *Oxyloma* species examined forming monophyletic units, confirming doubts concerning the validity of these species. Our next steps include gathering nuclear data and assessing anatomical characters to revise the taxonomy of Succineidae to better understand their evolutionary history.

P52

How can the city of Brownsville become self reliant?

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Located at the southern tip of Texas, the city of Brownsville, founded in 1848, encompasses 378.9 km^2 in which lives its 183,823 inhabitants (2016, US Census Bureau). According to the USDA, more than half of the census tracts within Brownsville are considered low-access food deserts, where residents have little or no access to fresh fruit and vegetables. As food access can be inversely related to the high rates of obesity within the county, in 2013 Brownsville pledged to improve public health and improve food self-reliance, or the ability to meet local demand through local food production, through the promotion and construction of community gardens, especially in areas considered to be food insecure. Currently, around 5 acres of community gardens and urban farms exist within Brownsville. Using estimated annual yield of community garden vegetable production (0.75 lbs/ft/year)2, community gardens in Brownsville can yield around 163,350 lbs of vegetables—approximately only 0.1% of current vegetable requirements, based on USDA recommendations. However, there is strong potential for improved food self-reliance since a significant portion of Brownsville is still is under agricultural land use: 3,056 acres (3.1% of total city land area) is under vegetable crop production, while 2,925 acres (3.0%) are planted in fruit crops. Additionally, another 26,075 acres of open space (28% of the city) and more than 1000 acres of city parks could potentially be transformed to increase local food production. With a rich agricultural history and nearly year round growing season, Brownsville could possibly be self-reliant in food, increasing municipal resilience, and the well-being of its citizens.

P53

Viability of the API ammonium testing kit for measuring ammonium concentrations

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Monitoring ammonium levels is important in aquaculture. While plants are able to use ammonium for growth, very small quantities are toxic to a wide range of animals. Unfortunately, mainstream methods of testing ammonium are expensive and involve cum-

bersome equipment. The purpose of this experiment was to determine whether the inexpensive API ammonium testing kit, typically sold for hobbyists, is a viable option for testing ammonium concentration in water. A test was devised to measure the accuracy of color absorbance (675 and 700nm) at varying parts per million of ammonia and at varying time intervals of 2, 5, 7.5, 10, and 60 minutes after reagents were mixed. From 0 ppm to 16 ppm, absorbance at 700 nm follows a strong linear relationship, with an R2-squared value of 0.9963. Above 16 ppm, the absorbance peak shifted from 700 nm to 675 nm. It was also found that the company instructions to allow 5 minutes to elapse before color measurement is an underestimate, and at least 7.5 minutes should pass before absorption is measured. The research found that the API ammonium testing kit is a viable option for measuring ammonium levels in water. The linear relationship given by absorbance peaks allows for accurate measurement of ammonium levels, the reagents used are stable in solution and can be used in the microliter range, allowing the kit to be used for many more tests. Thus, use of the API ammonium testing kit could decrease the cost of measuring ammonium levels in water substantially.

School of Earth, Environmental, and Marine Sciences (SEEMS)

P54

Evaluation on the effects of polyacrylamide, compost, biochar, and vermiculite for improving soil moisture content and wet aggregate stability

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There are a range of soil amendments and/or conditioners claimed to improve soil water retention, soil structure, and nutrient-holding capacity for agricultural and horticultural industry markets. The objective of this study is to evaluate the performance of common soil amendments (compost, biochar, and vermiculite) and the synthetic soil conditioner (polyacrylamide) in improving water holding capacity and wet aggregate stability without the use of plants under laboratory conditions. Compost is a well-known soil amendment and fertilizer that contains decomposed organic matter. Biochar is a porous charcoal, rich in stable carbon, that can endure in soil for many years and is considered to be one of the ways to sequester carbon into soils to mitigate climate change. Vermiculite is a hydrous phyllosilicate mineral with a porous surface. Polyacrylamide (PAM) is a generic term referring to a polymer formed from acrylamide subunits. Water-soluble, anionic form of PAM has a long history as a flocculant in water and wastewater treatment plant and has been used in furrow irrigation agriculture and construction site erosion for sediment control. Cross-linked PAM (insoluble) is a superabsorbent (hydrogel) which has been used in garden, landscape, and nursery situations as a way of retaining moisture. A pot experiment consisting UTRGV campus soil mixed with individual soil amendment/conditioners was designed and soil moisture monitoring is in progress for a 2-week period without plants. After the 2-weeks incubation period, all the pot materials will be tested for wet aggregate stability, which will serve as a proxy for soil resilience against erosion by water. Percent stable soil will be determined via Cornell Sprinkler Infiltrometer (simulated rainfall) and conventional wet-sieving method. The study results will provide practical information on the performance of various soil amendments/conditioners in terms of longevity in improving soil physical properties and their corresponding economic value.

P55

Increasing Local Produce Production in Weslaco, Texas

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The Rio Grande Valley, which includes the southern-most four counties in Texas, has huge contribution to the agriculture market. However, but much of the produce grown here is exported north, while much of the produce/food consumed by local area residents is imported. The purpose of this study is to determine the self-reliance of food for the city of Weslaco, TX (population 40330 (2016), seated in Hidalgo County. We looked at the potential of community gardens and farms within the city to determine the potential to meet the food demands of a growing populace. This was done by calculating the land and water requirements and yield potential of crops including: broccoli, cabbage, cantaloupe, lettuce, onion, potatoes, tomatoes, and watermelon based on the Texas Commercial Vegetable Production Guide. Geographic imaging analysis was used to find potential amount of land available to grow local produce. Other data was collected through informal interviews with Weslaco city officials, agriculture representatives, and school districts leaders, and was also included in the study. Based on the results of our study, we examine different ways to increase the regional access to locally grown fresh produce.

P56

Can San Benito Become Food Independent?

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Cities across the US and worldwide are becoming increasingly dependent on imports to meet their basic nutritional and water needs (Grewal, 2010). In this study, we evaluate the self-sufficiency of San Benito, TX (2016 population=24,476) in terms of food production and water use. San Benito accounts for a total of 41.8 sq km and based on archival, publicly available data, 10% (1032.9 ac) of its municipal land cover currently dedicated to agriculture and 45% (4648 ac) is open or undeveloped. . Water usage is approximated based on Cameron county water usage and corrected by census and land area data. These findings, can help serve as a baseline to explore various scenarios to improve the availability of locally produced food resources—for example, efforts to incentivize the conversion of portions of undeveloped land to agriculture can not only increase both its potential for self-reliance, but can also strengthen local economy, improve citizen livelihood, increase property value, promote community engagement, and offset negative environmental impacts. Some other potential solutions may include: expanding community gardens, encouraging residential gardens, providing education opportunities to increase water use efficiency and crop yield, and implementing urban/rooftop gardens wherever possible.

P57

Microbial Contaminants in Atlantic Oyster in Brownsville Waters

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Atlantic oyster also called American oyster is an edible and commercially important marine species, and has been a model organism for multidisciplinary studies involving pathogenic research. People eat raw oyster and can get infected from pathogenic bacteria. Bacterial pathogens rapidly facilitate and transmit infectious diseases to seafood consumers. For this reason, the American oyster represents a risk to the public health due to anthropogenic contamination in South Texas region specifically in Brownsville

waters that receives municipal and industrial drainage runoffs. The objective of this study is to investigate two important bacterial pathogens, *E. coli (Escherichia coli)* and *Salmonella* (*Salmonella enterica*), in the American oyster in Brownsville waters. Oysters were collected from San Martin Lake and South Padre Island during fall and winter. Gills and gonadal tissues were removed from body cavity and fixed in 4% paraformaldehyde at 4°C for immunohistochemical detection of bacterial pathogens. Coelomic fluid (body fluid) was collected rapidly and the pH and glucose levels were measured. Our immunohistochemistry results clearly showed that *E. coli* and *Salmonella* were not just within the lumen of gut but also in digestive gland, gills, epithelial barrier and connective tissue of oyster collected in San Martin Lake and South Padre Island. Coelomic fluid glucose levels were relatively constant in October and November but significantly lower in December, whereas fluid pH levels were significantly higher in South Padre Island in December compared to San Martin Lake. Fluctuating body fluid pH levels is a common indicator of environmental stress, whereas a pH rise on decreased glucose levels and low water temperature elucidates the anaerobic digestion of volatile acidic compounds by *E. coli* and *Salmonella* in oyster during winter. Collectively, our histological and immunohistochemical results, together with coelomic fluid pH and glucose levels suggest that Atlantic oyster is prone to water-borne pathogen contamination in Brownsville waters.

P58

Soil physical health in the Rio Grande valley agricultural land during cover crop growth

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Sustainable agroecological land management and organic farming practices has spurred increased interest in soil health nationally. Cover crops have the potential to provide multiple benefits in a cropping system. They reduce erosion, improve soil health, enhance soil water availability, suppress weeds, and help control pests with other benefits. Our study investigated selected soil physical parameters affected by various cover crop treatments in a field-scale in a commercial organic farming site located at Lyford, Texas. The experimental site consisted a total of 25 blocks (each block 400 m long and 5.6 m width having 6 rows in each of the blocks) representing 5 cover crop treatments in five-replicated trials: FP = Forage Peas, HV = Hairy Vetch, CC = Crimson Clover, FPT = Forage Peas + Triticale, and CO = Control (bare soil). The cover crops were planted in November 2017 and a series of physical parameters for soil health (Soil moisture content, bulk density, penetration resistance, and water infiltration rate) was determined in Feb-March 2018. Data analysis of these soil physical parameters affected by cover crops are under progress and preliminary results will be presented. In the long run, the study results will be used to demonstrate soil health management by cover crops and reduced tillage in vegetable production, which has not been tested in the Rio Grande Valley agricultural soils.

P59

Development of a field trial to promote improvements in soil conditions for crop production

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Farming our local soils is a challenging task giving its high salinity and alkaline pH, which decrease the availability of certain plant nutrients such as P, Fe, and Mn. In this project, we will evaluate the potential of amendments, such as compost and biochar, to improve

these limitations. In partnership with the McAllen Compost Facility, we are setting up a field study to assess soil nutrient availability and crop nutrient use. The field study comprises of five treatments: control (no amendment), inorganic fertilizer control, two types of compost, and biochar. We hypothesize that the compost treatments will directly provide nutrients to the plants as well as, during its microbial decomposition process, decrease soil pH. We also hypothesize that biochar will provide and retain certain nutrients such as P and NH_4^+, respectively. In our poster, we will present our experimental design, progress on field trial establishment, and planned laboratory analyzes. In addition to gaining experience in field trial establishment and maintenance, students involved in this project will perform literature review about compost and biochar; Perform field sampling and laboratory analyses; Data compilation, interpretation and reporting.

P60

Lunar Reproductive Cycle of Atlantic Sea Urchin in South Texas Waters

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The Atlantic sea urchin (Arbacia punctulata) is a unique invertebrate and a primeval species of Echinoderms. They are relevant to the environment due to their sustenance of marine algae as well as economically in their distribution as sea food (e.g. Japanese Sushi). Environmental phenomena such as water temperature and moonlight act as external cues that stimulate the reproductive activity of aquatic organisms. Tube feet located in the spines of the sea urchin serve as photosensory organs that respond to fluctuations in light. In order to acquire a better understanding of the correlation between gonadal maturity and lunar rhythm, the main objective of our study is to determine the lunar reproductive cycle of Atlantic sea urchin in the southern Texas waters of Gulf of Mexico. Sea urchins were sampled every week according to lunar cycle in South Padre Island from May to July. The gonadosomatic index (GSI, a biological indicator of gonad) of each sea urchin was calculated as the percentage of gonad weight/total weight measurements. The gonadal tissues were collected and fixed in 10% formalin for over 4 days. Fixed tissues were then embedded in paraffin, sectioned at 10 µm in a microtome machine and stained with hematoxylin-eosin. Subsequent histological examination of ovaries and testes was performed: maturity levels and spawning phases were determined quantitatively by calculating the percentage of oocytes (immature egg) and ova (mature egg) for each female and the production of sperm for each male. Morphological observations showed that ovaries developed synchronously towards the last quarter moon on June 17 and July 16, and the percentage of mature eggs decreased around new moon on June 23 and July 23. A similar pattern was observed in testicular development around the last quarter moon on June and July, which is consistent with increased male GSI and sperm production. Collectively our histological analysis suggests that the Atlantic sea urchin spawns synchronously according to lunar cycle in Texas waters.

P61

Evaluation of locally-sourced biomass for biochar as filter media

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Biochar is a carbon (C)-rich solid obtained by pyrolizing lignocellulosic biomass in an anaerobic environment. By the charring the biomass, much of the carbon becomes “fixed” into a more stable form and therefore can minimize carbon dioxide emission to

the atmosphere. When the resulting biochar is applied to soils, the carbon is effectively sequestered while improving soil structure and fertility. Another application area of biochar is to remove pollutants from contaminated water (filter media) based on its highly porous structure and reactive surface functional group. The objective of this study is to evaluate a range of biomass source from lower Rio Grande Valley for biochar production and their feasibility as filter media. The biomass materials included brown seaweed (Sargassum), palm tree wastes (leaf and trunk), avocado residue (seed and skin), and grapefruit peel representing marine waste (1), yard waste (2), and agricultural waste (3), respectively. All the biomass materials were thoroughly washed using tap water and they were oven-dried, pulverized and stored in room temperature. Two different biochar production methods will be employed: 1) pyrolysis using a laboratory tube furnace at 300ºC under nitrogen flow and 2) conventional pyrolysis by putting a commercially available biochar container ("biocharlie") in a charcoal grill. The produced biochar will be characterized for its chemical (pH, electrical conductivity, elemental composition C, H, O, N and S), surface morphological properties (surface area, scanning electron microscope) along with proximate analysis (moisture, volatile matter, fixed carbon, and ash content). Batch adsorption test will be performed using a synthetic lead (Pb) solution to evaluate performance of the produced biochars in removing aqueous Pb. The study results will provide valuable information on the feasibility of high-value biochar filter media derived from locally-sourced biomass materials that are otherwise considered to be wastes.

P62

Effects of Global Warming on Reproductive Functions, Heat Shock Protein Expression and Cellular Apoptosis of Eastern Oyster Gonad

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Global warming due to climate change is likely to intensify the heat/thermal stress in marine and coastal organisms, affecting their development, growth and reproductive performance. American oyster also called Eastern oyster (Crassostrea virginica, a native edible and commercially important marine oyster in the Eastern seaboard and Gulf of Mexico) is an excellent model species in response to global climate change. This marine species is a classic example of how global warming affects organism's normal reproductive functions. In this study, we tested gonadal development, heat shock protein expression and cellular apoptosis in gonad, and coelomic fluid (CF, an important body fluid that helps regulate important physiological functions) pH in American oyster under elevated sea water temperature. Oysters were placed in six different 20-gallon aquariums with various temperatures under controlled laboratory conditions for one week. Two of these aquariums were at a controlled temperature (24°C), followed by two at medium temperature (28°C), and the remaining two at high temperature (32°C). Ten oysters from each aquarium were dissected and sampled for normal histological observations of gonadal functions, immunohistochemical analysis of heat shock protein expression, in situ Terminal deoxynucleotidyl Transferase (TdT) dUTP Nick-End Labeling (TUNEL) assay for goandal apoptosis, and also biochemical analysis for coelomic fluid. Oysters exposed to higher temperature showed an increase of heat shock protein expression in eggs of ovary and spermatogenic cells of testis, as well as an increase in cellular apoptosis in gonadal tissues. High temperature also significantly increased pH levels of the coelomic fluid in oyster. Collectively, these results suggest that high temperature has negative impacts of gonad development and reproductive functions in American oyster.

P63

Calculating Edinburg's Current and Potential Self-Reliance in Food

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Many cities in the U.S. meet their food needs through imports grown in other states and countries. This dependency creates leakages and waste in the food system in the form of money leaving the community, transportation costs and emissions, and increased vulnerability to disasters. To address these shortcomings, some cities have begun calculating their current and potential self-reliance for their citizens' daily food needs. Edinburg, Texas, the county seat of Hidalgo County, is geographically and demographically distinct from other cities where such assessments have been conducted. Located in one of the top vegetable and citrus producing counties in Texas, Edinburg (population 87,650 (2016)) is a peri-urban area that still includes local farmland. The city also faces unique challenges as one of the poorest metropolitan areas in the U.S. with particularly high rates of obesity. This combination represents a unique opportunity for meeting dietary needs in a healthy and sustainable way through self reliance, or the ability to produce food locally Actual food self-reliance for Edinburg is calculated as the percentage of food expenditures that is produced within city limits (food production / food expenditures). Based on production data from the U.S. Census of Agriculture and expenditure data from the Bureau of Labor Statistics, Edinburg's current self-reliance is 27.7%, although the realized self-reliance is likely considerably lower.Potential food self-reliance is calculated for several scenarios using a GIS based estimate of open and abandoned areas that could be converted to food production to improve local yield estimates (area*yield/intake). This assessment could contribute to a more informed conversation about Edinburg's current food resilience and pathways to increased self-reliance in the future.

P64

Assessing coastal city self-reliance under the influence of highly variable seasonal population

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The majority of modern cities are unable to provide their daily food and water needs, forcing them to import these essential goods, sometimes from thousands of miles away. This practice creates large, unsustainable food-sheds, with high food and water costs, and large emissions of greenhouse gases. This problem may be compounded by high tourism rates and large numbers of non-permanent residents, creating both seasonally variable populations and resource consumption. We consider the potential self-reliance of two coastal cities with high tourism in the Lower Rio Grande Valley, Port Isabel (PI) and South Padre Island (SPI), examining the ability of these two cities to reduce their food-shed size by assessing and comparing current and potential food and water consumption and production. We determine current sustainability potential by comparing the amount of food produced in and around the cities (focusing on vegetables, fruits, honey, seafood, and poultry production). Using this baseline sustainability level, we explore how sustainable PI and SPI could become by assessing potential agricultural and fisheries expansion. Agricultural expansion around the cities is not possible due to binding bodies of water (the Gulf of Mexico, Laguna Madre, and Bahia Grande) and federally protected land (Laguna Atascosa National Wildlife Refuge); therefore expansion must occur within city limits. If socially and environmentally possible, fisheries expansion would occur in the Gulf and Laguna Madre. In addition to exploring practices that reduce food-shed size, we also examine the sustainability of local water resources

by assessing water availability, usage, and potential increases due to expanded agriculture. We assess sustainability for the permanent population, and then explore the impacts of a highly variable seasonal population on achieving self-reliance.

P65

Wood density of various tree species

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Understanding how plants differ in their response to moisture stress is important because the Rio Grande Valley's climate is very hot and experiences droughts often. The physical characteristics of a plant, such as wood density, may be a key factor, as they determine the conductivity of water through a plant. The present study was performed at the University of Texas Rio Grande Valley campus. We used the TreeCampus database to guide selection of trees. Six distinct tree species were tested using water displacement methods in order to derive wood density. For each tree, we collected three branches and cut the branches into three small sections. Each section was tested and the results of the analysis ranged from 0.1 g/cm^3 to 0.8 g/cm^{3}for wood density, with an overall mean of 0.6 g/cm^3. These results will be related to more detailed aspects of water transport in plants in future research.

P66

ZnO Copper(II) oxide Iron(III) oxide Iron(II,III) oxide were tested on the plant to enhance the growth and germination

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Agriculture is a very important field of study, it provides us with the food we need. With conventional practices of farming, the nutrient is striped from the soil and supplemented with environmentally unfriendly chemicals that are not sustainable. The present study was conducted to examine the effects of copper oxide nanoparticles (nano-CuO) on kale (*Brassica oleracea*) plant growth after treating their seeds. The experiment was conducted under controlled conditions with randomized placement design with five replicates and three different treatments of kale seeds. Three aqueous solutions with nano-CuO concentrations of 0 (as a control without adding and nanoparticles), 30, and 70 ppm were prepared in milli-Q water. The seeds were soaked in these solutions for 24 hours. Seeds were directly sown and after 34 days the plants were harvested. The results showed that the length of the roots and the shoots of the obtained kale were positively affected by the nano-CuO: larger increase came from the seeds treated with 70 ppm nano-CuO while both nano-CuO treated seeds showed increased growth compared with the control sample. Moreover, the dry weight of the kale plants was also impacted by the nano-CuO treatment: larger increase was produced from the seeds treated with 70 ppm nano-CuO relative to the control. This study shows that the application of CuO nanoparticles at appropriate concentrations causes proliferation on the growth and development of kale.

P67

Parks and Gardens: a Study of Food Security in Harlingen, Texas

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Governments, particularly local municipalities, are faced with meeting a growing demand for food due to increases in population and shifts in the dietary needs of their citizens. Producing and distributing food locally will strengthen the economy, decrease greenhouse gas emissions associated with transport, promote health and wellness, and

increase a sense of community. The city of Harlingen (population 68,150), located in Cameron County, is an example of a city with the potential for burgeoning self-reliance, a measure of the capacity for cities to meet local dietary needs within its own city limits. According to the USDA, the average person needs 3.5lbs of fruit per week and 4.375lbs of vegetables per week (based on a 2,000 calorie diet), representing a total of 238,525lbs and 298,156.25lbs respectively for the entire population of Harlingen. An analysis was done looking at current food production and the potential for self-reliance within city limits. Our estimates suggest that Harlingen is currently 5.6% self-reliant in the production of fruits and vegetables, producing enough to fulfill the caloric needs of over 180 families weekly. Most of this food production occurs within 7 acres of an urban farm that currently produces an estimated 98,280lbs of fruits and 122,850lbs vegetables annually, accounting for only 1% and 0.7% of total dietary requirements for the city. However, at full capacity, this urban farm (which totals 75 acres) has the potential to meet 10% and 7% of fruit and vegetable needs. Additionally, we explore the use of existing 365.9 acres of park land, some of which could be used to grow food for the city. Repurposing 25% of space within the city parks for community gardens and utilizing the current farming infrastructure would drastically improve Harlingen's food system and development of sustainable practices.

P68

Can the City of McAllen be Self Reliant in Food?

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Cities worldwide rely on imported goods to maintain wellbeing and meet requirements for food and water. The dependency on external goods not only reduce the resilience of such cities, but also creates pollution, economic leakage, and negative impacts to the environment. It also resilience of cities as they come to McAllen (population 142,212 (2016)) is a rapidly growing city at the center of Hidalgo County, the most agriculturally rich county in the state of Texas. However, McAllen also suffers from high rates of food related diseases, and food insecurity, despite surrounding agriculture and a year-round growing season. For this study, we examine the amount of fresh produce currently grown in the city limits to examine the potential for McAllen to meet its food requirements. The estimated annual intake of some food groups (based on USDA's per capita food availability data system) for McAllen are the following: Total Egg demand= 25,541,275; Total Fruits and Vegetable (fresh and processed) = 89,877,984 Pounds; Total Chicken= 12,699,531 Pounds. Currently, the self-reliance for McAllen for these products are extremely low-there are two known farmers markets where residents can buy fresh produce grown locally and only a couple of community gardens (< 1acre). We explore the potential of transforming vacant lots and land (including school grounds) within city limits to generate fresh produce to satisfy McAllen's demand for food. This may help increase benefits to local residents' health, the local economy, and a positive impact on the environment by managing resources in a more sustainable way.

P69

Estimating food self-reliance of Pharrr, Texas

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Amidst growing populations and emigration to urban areas , cities largely rely on the importation of resources to meet their daily basic needs. For example, food and other resources are often shipped across continents which causes the rapid use of fuel which increases the cost for the economy. -Increasing municipal food self-reliance, or the a city's ability to meet local needs with local production, will not only improve city resil-

ience, but can improve local economy and the health and well-being of local residents, especially in areas with rising obesity and where food access is scarce (especially in lower income households). In this study, we explore the current and potential food self reliance of Pharr, Texas, a rapidly growing, small city (population 77,320) in deep south Texas. We explore three different scenarios that explores the use of vacant lots, residential lot, and industrial and commercial rooftops that may allow for the city to become self-reliant.

School of Mathematical and Statistical Sciences

P70

The Inverse Scattering Transform for the Korteweg de-Vris Equation

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In this Poster, we will show how to solve the Korteweg de-Vris (KdV) equation via the inverse scattering transformation method. We will present the direct scattering problem, as well as the time evolution of the scattering date. Then, we will show the GelfandLevitan-Marchenko (GLM) equation in order to solve the inverse scattering problem of the KdV equation. Finally, we will construct and show explicit soliton to one- and two-soliton solutions for the reectionless case.

P71

Antenna Design Optimization

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Antennas are devices that launch or receive radio waves. The typical parameters to consider in building an antenna include the frequency, gain, bandwidth, directivity, and polarization. In previous work it has been shown that log-periodic dipole antennas (LPDAs) can produce high-quality circular polarization over a substantial bandwidth, while maintaining gain typical of that observed in conventional LPDAs. This research focuses on the optimization of the gain and axial ratio of LPDAs with frequency operation of 500MHz-3GHz modeled as a linear optimization problem having seven variables and ten constraints. Through direct search methods an optimal gain of 7.73dB and axial ratio of 0.919310 were obtained for a 22-element LPDA. Our results show improved gain, axial ratio bandwidth, and VSWR. Applications of the new 22-element LPDA include surveillance, measurements, compliance testing, and electromagnetic surveys.

P72

Fair Division Problem

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Fair division is the problem of dividing a set of goods or resources between several parties who have an entitlement to them, and thus, each party receives a fair share. This topic is extensively researched in the area of mathematics, economics, social choice theory, game theory, and more. A central concept in the literature on economic fairness is envy-freeness; an allocation is envy-free if no party prefers the share allocated to another party over their own share. In this project, I studied existence of envy-free allocations when the goods that are to be allocated are indivisible and heterogeneous, and in addition, when there is one perfectly divisible good. Consider the following problem: several rooms with different characteristics and given capacities are available in a house and the total rent for that house needs to be divided between the rooms. In this situation, envy-freeness comes down to a market clearing condition: Prices are assigned to every room such that when each party chooses their favorite room with the given prices, supply equals demand and the market clears. This situation is called rental harmony. The rental harmony theorem and its corresponding algorithms rely on Sperner's lemma. In this project, we consider this lemma and its extensions. This result can be applied to the rental harmony theorem with some boundary conditions and many other fair division problems.

COLLEGE AWARD FOR EXCELLENCE IN MENTORING
KAREN MARTIROSYAN

Dr. Martirosyan is an internationally recognized scientist, educator and mentor, in the field of Nanoscience and Nanotechnology. He has pioneered growth of a new field of research at the University of Texas Rio Grande Valley (UTRGV) and earlier in the legacy institution, the University of Texas at Brownsville (UTB), in solid state nano physics which involves a large group of successful undergraduate and graduate students and post-doctoral scholars. His strong contributions in students Mentoring have enhanced the visibility of the University in the state, in the nation and beyond by fostering inter-disciplinary collaborations. He has been highly successful in obtaining external funding that has helped establishment of a cutting edge Advance Nanoscience Laboratory at UTRGV (earlier at UTB), housing very unique research facility that allows Dr. Martirosyan to train and mentor 10+ students for each semester including summer programs for high school students and NSF-REU/RET scholars. This activity is greatly demonstrated improvements in student engagement and achievement. He has secured ~$2 Million as a principal investigator (PI) and as co-principal investigator (co-PI) from the National Science Foundation (NSF), Department of Defence (DOD), US Air Force, UT M.D. Anderson. He has also been a senior investigator on many other important federal grants, amounting to about $10 Million. Dr. Martirosyan has emphatically shown leadership by creating the first Advanced Nanosience Laboratory at UTB/UTRGV that continues to generate high quality mentoring activities. Dr. Martirosyan's grants have supported Undergraduate, Master and Doctoral students and have had immense positive transformative impact for students support and Mentoring in STEM fields. Over the last five years, Dr. Martirosyan has mentored more than 60 undergraduate students, 7 M.S. Physics students and 3 Doctoral students in the UTRGV/UTSA/UTA cooperative Ph.D. programs. Dr. Martirosyan's students have shown extraordinary achievements through co-authoring 47 peer-reviewed journal publications and more than 50 conference papers including important national meetings like APS and MRS with student-authorships. The students mentored by Dr. Martirosyan were awarded several regional and national awards at the research conferences. This remarkable achievements are increased the student retention and graduation rate. Dr. Martirosyan has contributed greatly towards recruitment and retention of high quality students in the physics programs. This is to generate interest and awareness of STEM education. He has proactively recruited qualified students locally. Dr. Martirosyan as a PI received the NSF funding to develop Nanoscience educational program. The program is designed to address the need for an interdisciplinary undergraduate education that extends beyond the traditional disciplines and skills that are taught within any existing departments at College of Sciences. This program is reached out to a large group of undergraduate students ~200 in a coordinated manner that enables student's knowledge and skills, as well as facilitates efforts of individual faculty members. The most distinguished feature of Dr. Martirosyan's mentoring is how he helps his students to build their professional career and life outside of the University. Dr. Martirosyan is constantly shared his experience and knowledge to find career related information and experience to various professional resources, opportunities, and networks. In addition, Dr. Martirosyan has afforded both emotional and moral support and inspiration through career related advising and coaching.

COLLEGE AWARD FOR EXCELLENCE IN TEACHING
MEGAN KENIRY

Dr. Megan Keniry is an Assistant Professor in the Department of Biology in the College of Sciences at UTRGV. She is a dedicated teacher who actively integrates teaching and research activities. She has taught undergraduate Cell Biology lecture and laboratory sections for almost five years with uniformly positive student and peer evaluations. She includes flipped classroom experiments in her curricula. The undergraduate course was expanded to accommodate student demand from 48 to 150 students per lecture course providing key conceptual understanding for students pursuing graduate and medical professional training. She uses technology such as Tegrity for her courses to allow students to better study. She has taught graduate courses: Advanced Cellular Biology and Physiology and Advanced Cellular and Molecular Biology. The Advanced Cellular and Molecular Biology was taught using a live online format to accommodate students on the Edinburg and Brownsville campuses. Dr. Keniry has also mentored students to perform research in her laboratory where she investigates transcriptional programs that drive aggressive cancers. Last year, seven of her mentored students matriculated into graduate programs. This year, at least two students will matriculate into doctoral studies at Texas A&M, College Station. She has mentored 5 Master's, 26 undergraduate and 9 high school students in her laboratory while on tenure track. Dr. Keniry is the project director of the NIFA USDA H.S.I. Program ELU2. This program provides financial support for undergraduate and graduate researchers at UTRGV and TAMUK. Through the USDA ELU2 Program, she established a seminar series that invites USDA scientists and UTRGV faculty members to present their research. The USDA seminars are attended by many UTRGV students, giving them exposure to science and opportunities for research as well as employment.

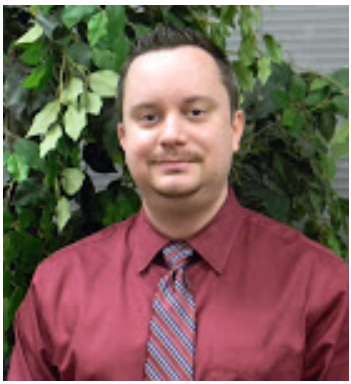
COLLEGE AWARD FOR EXCELLENCE IN RESEARCH
BAOFENG FENG

Dr. Baofeng Feng is a full professor in the School of Mathematical and Statistical Sciences with the College of Sciences at UTRGV. Over the course of his career at UTPA/UTRGV since 2003, he has established a strong research agenda in applied and computational mathematics, which include mathematical modeling of nonlinear waves with applications in fluid dynamics and nonlinear optics, continuous and discrete integrable systems and numerical methods for partial differential equations. Dr. Feng has published over 70 peer-reviewed research articles and most of which are in high impact, highly ranked journals. Especially, in the past five years, he has contributed 32 papers in peer-reviewed high quality journals. Dr. Feng has been successful in obtaining external grant funding for research from prestigious and highly competitive funding agencies including National Science Foundation (NSF) and Department of Defense. So far, Dr. Feng has been awarded six external grants, which include three from NSF, one from U.S. Army Research Office, Department of Defense and two from National Science Foundation of China for overseas researchers/scholars. Dr. Feng was also awarded Japan Society of Science Promotion (JSPS) research follows twice in 2007 and 2012, respectively. Dr. Feng has been very active in promoting mathematical research and advertising UTPA/UTRGV by organizing conferences and special sessions at national/international conferences. So far, Dr. Feng has organized four conferences, among them two were held at UTPA/UTRGV supported by NSF grants. He also organized over twenty special sessions at national/international conferences, and made over 110 presentations at all levels of conferences and invited colloquia/seminars. Dr. Feng initiated Applied Mathematics Seminar and Mathematical Physics Seminar, and co-organized the Rio Grande Valley High School Math Contest and University Mathematics Competition, which inspired other researchers and many high school and college students.Dr. Feng is an outstanding research scholar who is highly accomplished and well recognized for his research around the world. He has many productive research collaborations with scientists in the US and in several other countries. He is internationally recognized as a strong pillar in nonlinear wave phenomena and discrete integrable systems.

COLLEGE AWARD FOR EXCELLENCE IN COMMUNITY ENGAGEMENT
TERESA PATRICIA FERIA

Dr. Feria joined the Biology Department as an Assistant Professor in 2008. She earned both her B.S. in Biology with honors (1997) and an M.S. in Animal Biology (2001) from The National Autonomous University of Mexico (UNAM). She then went on to complete a doctoral degree in Biology at the University of Missouri-St. Louis (2007) and subsequently finished two post-doctoral appointments (Missouri Botanical Garden-Center for Conservation and Sustainable Development and UNAM, Mexico). Dr. Feria's research focuses on understanding present and future (under climate change scenarios) distribution of living organisms using Geographical Information System (GIS) technologies and Species Distribution Models. Her lines of research are related to endangered, invasive, and vector borne disease species. Her teaching, research, and service activities have been recognized via different awards. She won the Provost's International Studies Award in 2011 and the Teaching Excellence Award from the College of Science and Mathematics in 2012. In recognition of her trajectory in teaching and research, she was also named as a Kika de la Garza Education Science Fellow in 2013. She became part of one of the most prestigious international lists of researchers: SNI (Sistema Nacional de Investigadores, Mexico) in 2014, where criteria for inclusion includes teaching and mentorship roles with undergraduate and graduate students. This spring, she also received the Outstanding International Female Faculty recognition award at UTRGV. Dr. Feria has been able to engage the community in her teaching, research, and service activities at The University of Texas Rio Grande Valley (UTRGV), contributing in this way towards student success and UTRGVs' strategic plan for "Transforming Lives". Her culturally relevant courses include 30 hours of service and experiential learning activities that allow students to develop community engagement projects on topics related to improving the environmental conditions and human health (e.g., recycling tires into beautiful pots for native-edible plants, prevent mosquito-borne diseases). Dr. Feria's transformative research program is addressing the knowledge gap on Chagas disease in South Texas through motivation of her students, and engagement with the community in research that involves citizen science and educational projects which aim prevent-control the disease among local residents. Dr. Feria's students work with community organizations like LUPE (La Union del Pueblo Entero), UNIDOS, Proyecto Desarrollo Humano, and HOPE. Dr. Feria has published 25 scientific papers, 8 book chapters and 2 scientific reports. She has obtained national, binational (Mexico-USA) and international (Mexico, Spain) research grants that support students in developing research. Dr. Feria works with multiple national and international collaborators (UNAM, CDC, CENAPRECE, Baylor School of Tropical Medicine, Texas A&M, Citrus Center, USDA ARS), as well as with faculty from different disciplines at UTRGV, across colleges. Dr. Feria's teaching, research, and service activities are focused on bringing educational opportunities to national and international students, as well as to addressing the needs of our local Rio Grande Valley communities.

COLLEGE AWARD FOR EXCELLENCE IN SERVICE
TIM SEARS



Tim Sears is a founding faculty member of the UTeach RGV Program in the College of Sciences. As an Assistant Professor in Practice and UTeach Science Master Teacher, he has taught and supervised undergraduate science and mathematics majors, including Clinical Teachers, in each of the UTeach pedagogy and field courses focused on secondary science and mathematics content and instruction. Mr. Sears believes that UTeach graduates should have a deep understanding of the content they teach, apply inquiry approaches to engage students, and use a range of strategies to assess and improve their students' learning.

Tim's involvement in regional, national, and international service began during his work at the nearby Weslaco Independent School District where he worked until 2012 as a high school science teacher and then as a district-level coordinator for secondary science and Advanced Placement® programs. During the past six years, Tim has provided service to the UTeach program as a chair or member of several committees, a faculty mentor and advisor for various initiatives, and a coordinator and instructor of science review sessions for the state's educator certification exams each semester. Each year, he forms partnerships with local school districts to expand student field placements, as well as expand volunteer opportunities for undergraduate members of the UTeach student organization for which he is a faculty advisor. At the College level, he has presented lessons to students and workshops to teachers through the UTRGV Center of Excellence in STEM Education, and he has encouraged and supported students from the UTRGV Mathematics and Science Academy to present their science research at regional, state, and international competitions. He enjoys coordinating and providing professional development to local educators: he co-chaired a conference for high school science education hosted at the university in 2015 in conjunction with the Rio Grande Valley Science Association of Texas for which he is a board member, and he recruited secondary teacher participants and coordinated field trips during a series of agroecology summer institutes at UTRGV. Each year, he volunteers as a committee member of the Rio Grande Valley Regional Science & Engineering Fair and the Texas Science & Engineering Fair, and judges at state and local fairs. He has been Chair of the Advisory Council for the Intel International Science & Engineering Fair and especially enjoys helping to coordinate the interpreters at the international competition for high school students each year. Tim never misses an opportunity to involve UTRGV students in these service activities because he believes that pre-service teachers that participate in worthwhile STEM-related programs will be likely to involve their own students in similar opportunities in the future.

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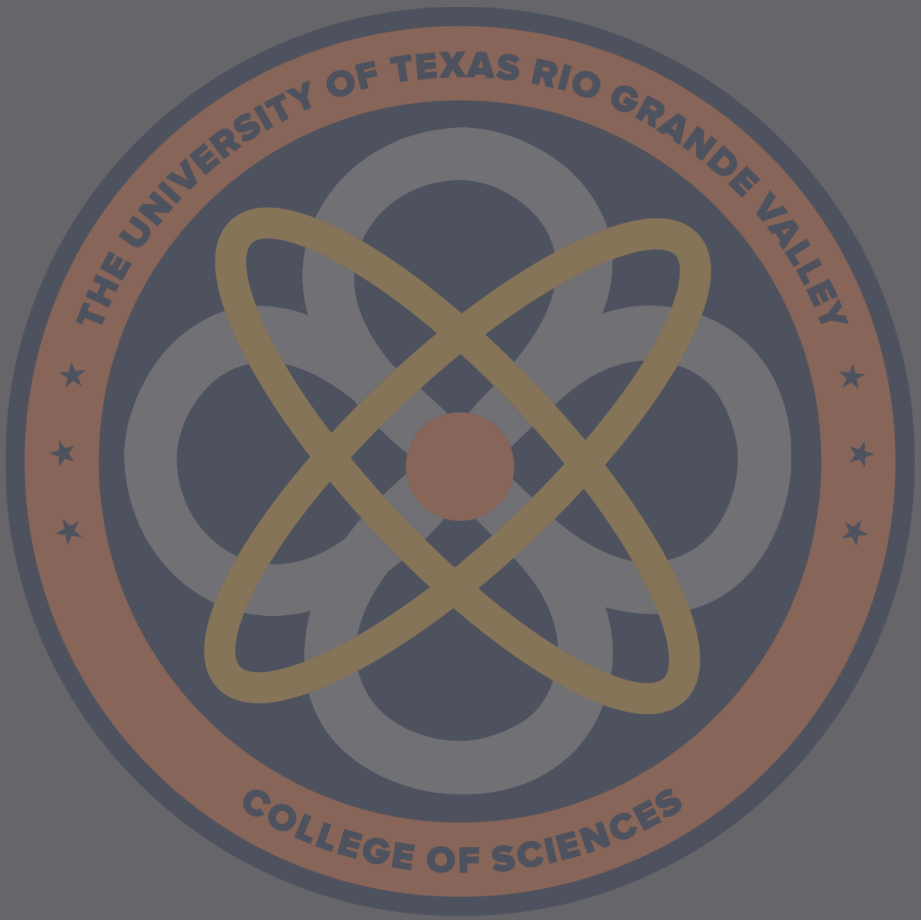

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