1:00 - 1:10  Welcome and Acknowledgments - Drs. Franklin and Kasner

Presentation Session I

1:10 – 1:30  Presentation 1................................................................. .........................Joshua Wynn
COMPARISON OF CHERT GEOCHEMISTRY AND FLINT KNAPPING WORKABILITY.

1:30 – 1:50  Presentation 2................................................................. ..........................Mason Taylor
THE ROLE OF RECA IN TUBERCULOSIS DRUG RESISTANCE.

1:50 – 2:10  Presentation 3................................................................. ..........................Victoria Solis
USING VHF RADIO TELEMETRY TO DETERMINE HOME RANGE AND HABITAT USE OF
LADDER-BACKED WOODPECKERS (PICOIDES SCALARIS) IN THE TEXAS PANHANDLE.

2:10 - 3:40 – Poster Session and refreshments – MSB Hallway
Presentation Session II

3:40 – 4:00  Presentation 4................................................................. Mayra Herrera-Gonzales
BULLIED C57BL/6J MICE DISPLAY CROSS-SENSITIZATION BETWEEN STRESS-INDUCED
ALCOHOL DEPENDENCE AND SALTY HIGH-FAT DIET PREFERENCE: AVERSIVE SALTY
HIGH FAT DIET BECOMES PALATABLE.

4:00 – 4:20  Presentation 5................................................................. Josiah Morales & Aaron White
BULLIES CD-1 RETIRED BREEDER MICE ARE RESILIENT TO CROSS-SENSITIZATION
AMONG STRESS, ALCOHOL INTAKE, AND SALTY HIGH-FAT DIET PREFERENCE.

4:20 – 4:50  Presentation 6................................................................. Jake Brozek
CYTOTOXIC AND APOPTOTIC EFFECTS OF CHAGA MUSHROOM (*INONOTUS OBLIQUUS*)
ON CULTURED 4T1 MURINE BREAST CANCER CELLS.

5:00 - 6:30  Dinner and Awards Ceremony (Multi-Purpose Room)
All presenters, coauthors, and MSCI Majors are invited for dinner
catered by Weekenders BBQ.
Spring Research Day 2017 – Posters

Research Posters

1) **USING LOCAL GC PERCENTAGE TO DETECT UNUSUAL REGIONS IN BACTERIAL GENOMES.**
   Sharon DeMerritt*, Gracia Sebastiao* & Robert Moore. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

2) **QUALITATIVE ANALYSIS OF IMPRINTING AND BONDING FOR PDMS BASED MICROFLUIDIC DEVICES.**
   Ethan Nicholson* and Robert Moore. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

3) **BASELINE SURVEY OF TEXAS HORNED LIZARDS IN THE TEXAS PANHANDLE.**
   Sara A. van der Leek* & Andrew C. Kasner. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

Class Posters

4) **FOUNTAIN OF YOUTH FOR FRUITS AND VEGETABLES.** Jake Brozek, Dillon Frazier, Ernesto Lizardi, Josiah Morales, Mylie Oberg & Robert Moore. Biochemistry II Class - School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

5) **RAINFALL EFFECTS ON POST OAK GROWTH.** Darby Dehass, Andrea Bond, Daniel Klerekoper & Robert Moore. Scientific Computing Class - School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

6) **PRECIPITATION FOR DOUGLAS FIR TREE GROWTH.** Valeria Garcia, McKayla Ramirez, Kyle Rickman & Robert Moore. Scientific Computing Class - School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

7) **SHORT LEAF PINE RING WIDTH DATA AND PDSI DATA IN THE CLEMSON REGION.** Joshua Wynn, Makayla Nicholson, Terry Condren & Robert Moore. Scientific Computing Class - School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.
Abstracts for Spring Research Day 2017 Presentations

1) COMPARISON OF CHERT GEOCHEMISTRY AND FLINT KNAPPING WORKABILITY. Joshua Wynn* & Tim Walsh. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

Possible relationships between the geochemistry of various chert samples and their workability into stone tools were investigated. A number of chert types utilized by ancient peoples in the manufacturing of stone tools were identified, including Alibates (TX), Arkansas Novaculite (AR), Caballos Novaculite (TX), and Burlington chert (MO). Samples of the chert were knapped and graded on a workability index. The index is based on key aspects of flint knapping which determine the difficulty in effectively obtaining a stone point. Geochemistry of these chert, obtained from published literature, was examined. The chert geochemical characterizations were compared to the workability index grades for investigating correlations between the two. For example, the research included a study of chert samples with higher traces of iron to find any possible knapping characteristics exclusive to that characteristic. Although study continues, “number of inclusions/sample purity” and “internal fractures” appear to play a greater role in workability than minor geochemical disparities. During petrographic examination the highly workable nodular chert matrices contained lineated fracture planes. This suggest that the petrology of chert may have some influence on flint knapping workability. Further research is currently being conducted to test this reasoning. The selective use of a specific chert type by ancient stone workers may have been more driven by availability than by slight differences in workability resulting from geochemical variation.

2) THE ROLE OF RECA IN TUBERCULOSIS DRUG RESISTANCE. Mason Taylor* & Robert Moore. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

RecA is a DNA repair protein that uses sequence exchange in order to repair DNA. RecA can tolerate a certain amount of mismatch during sequence exchange, but given the absence of any mismatch repair mechanism in Mycobacterium tuberculosis, it is possible that RecA can be implicated in the large number of drug-resistant strains caused by single-nucleotide polymorphisms. Electrophoretic-mobility shift assays (EMSA’s) were used to evaluate affinity of RecA to multiple 83 nucleotide-long single stranded DNA segments (and their complements), each corresponding to areas in the M. tuberculosis genome and centered on a codon that, when mutated, yields drug resistance. RecA demonstrated different binding affinities between complementary strands, suggesting sequence specificity. To explore the source of this differential binding affinity, the oligomer corresponding to a sequence from the katG gene, centered on the S315 codon, which when mutated to threonine, yields isoniazid resistance, was divided into three 23 nucleotide-long sections, dubbed A, B, and C. EMSAs were run on oligonucleotides AAA, BBB, CCC, and their complements. RecA exhibited a consistently low affinity with the BBB and CCC complements, that is, the regions on the non-coding strand including and immediately prior to the codon which, when mutated, leads to drug resistance. In conjunction with previous research that demonstrated that RecA is directed more strongly to damaged DNA with low thermostable mismatches, and given that the nature of this mutation would involve a fairly thermostable mismatch, our data suggest that RecA would tolerate the S315T mutation if it arose during DNA repair.
3) USING VHF RADIO TELEMETRY TO DETERMINE HOME RANGE AND HABITAT USE OF LADDER-BACKED WOODPECKERS (PICOIDES SCALARIS) IN THE TEXAS PANHANDLE. Victoria K. Solis* & Andrew C. Kasner. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

Ladder-backed Woodpeckers (Picoides scalaris) were tracked using VHF radio telemetry in Blanco Canyon, near Floydada, TX to determine home range and core area sizes of individuals, habitat associations, and tree species use for males and females. A total of 7 (4 female and 3 male) woodpeckers were tracked throughout the summer months from May-Aug 2016, resulting in 138 point locations (about 20 point locations per woodpecker). Average home range size for all 7 birds was 8.75 ha (3.37 – 13.42 ha). Average home range for females was 10.57 ha, and average home range for males was 6.32 ha. Home range sizes were not significantly different for males and females (T = 1.91, P = 0.129, df=4). Average core area size for all birds was 0.11 ha (0.05 – 0.24 ha). Average core area for males was 0.13 ha, and average core area for females was 0.08 ha. Core area sizes were not significantly different for males and females (T = -0.76, P = 0.528, df=2). Plant species richness was higher at male point locations (average total richness=3.93) than female point locations (average total richness=3.05) (T = -4.40, P = 0.022, df=3). Male woodpeckers were located more often in areas with more mesophytic plant species near the riparian corridor, and females were present in xeric areas adjacent to the riparian corridor. Tree use by males and females reflected these associations, with females using mesquite (Prosopis glandulosa) and hackberry (Celtis occidentalis) more often, and males using elm (Ulmus sp.) and other mesophytic trees more often.

4) BULLIED C57BL/6J MICE DISPLAY CROSS-SENSITIZATION BETWEEN STRESS-INDUCED ALCOHOL DEPENDENCE AND SALTY HIGH-FAT DIET PREFERENCE: AVERSIVE SALTY HIGH FAT DIET BECOMES PALATABLE. Mayra Herrera-Gonzales*, Josiah N. Morales & Daniela Pereira-Derderian. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

Stress-induced alcohol intake triggers neuronal plasticity; however, it is unknown if it cross-sensitizes with natural rewards like salty high fat diet (HFD). We investigated if CSDS-induced ethanol intake affects salty HFD preference. Male C57BL/6J mice were subjected to two salty HFD preference curve before and after CSDS-induced ethanol consumption. The two-food choice curves consisted of 0.5g% of NaCl along with another HFD containing one out of seven different NaCl concentrations: 0.125, 0.25, 0.5, 1, 2, 4, and 8g% NaCl. Consumption of HFD with increasing NaCl concentrations for CSDS-VEH group during curve 1 was 1.13±0.24, 1.34±0.18*, 1.08±0.12, 0.99±0.09, 0.44±0.10*, 0.10±0.03*, 0.02±0.01* g/20g b.w., respectively (*p< 0.05 0.5g% same curve) and 1.05±0.10, 1.17±0.06*, 0.56±0.10, 0.81±0.06, 0.73±0.9*#, 0.37±0.05#, 0.05±0.01* g/20 g b.w., respectively for curve 2 (#p< 0.05 same diet, curve 1). The consumption of HFD 0.5 g% NaCl during curves 1 and 2 were similar: 1.13±0.24, 0.54±0.15, 0.78±0.12, 0.74±0.08, 1.31±0.10, 1.53±0.05, and 1.67±0.04 g/20g b.w., respectively. CSDS-EtOH displayed similar pattern of salty HFD preference during curve 1; however, the preference for HFD 1 and 8g% NaCl were further enhanced in curve 2. Mice from both groups preferred HFD 0.25 and avoided HFD 2, 4 and 8g% NaCl compared to HFD 0.5 g% NaCl in both curves. CSDS enhanced HFD high in NaCl and CSDS-induced EtOH dependence further increased HFD high and very high in NaCl.
5) BULLIES CD-1 RETIRED BREEDER MICE ARE RESILIENT TO CROSS-SENSITIZATION AMONG STRESS, ALCOHOL INTAKE, AND SALTY HIGH-FAT DIET PREFERENCE. Josiah N. Morales*, Aaron White*, Mayra Herrera-Gonzales & Daniela Pereira-Derderian. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

Stress-induced alcohol dependence cause long-term changes in reward pathways. Salty food intake can be rewarding but in excess it is harmful. We investigated if CD-1 retired breeder mice, previously used in CSDS, challenged with forced swim stress (FSS) or FSS followed by ethanol intake altered salty high-fat diet (HFD) preference. Male CD1 mice were subject to two salty HFD preference curves before and after either FSS or FSS followed by ethanol consumption. The two-food choice curves consisted of HFD 0.5g% of NaCl along with another HFD containing one out of seven different NaCl concentrations: 0.125, 0.25, 0.5, 1, 2, 4, or 8g% NaCl. FSS was performed for 6-min for 10-days and intermittent water-water (FSS-VEH,n=7) or ethanol-water (FSS-EtOH,n=8) exposure for 4-weeks. Consumption of HFD with increasing NaCl concentrations for FSS-VEH group during curve 1 was 1.12±0.09, 0.99±0.07, 0.83±0.06, 0.88±0.04, 0.80±0.07*, 0.08±0.03* g/20g b.w., respectively (*p< 0.05) and 1.11±0.17, 0.91±0.10, 0.44±0.05, 0.58±0.14, 0.31±0.08*, 0.02±0.01* g/20g b.w. for curve 2. The consumption of HFD 0.5g% NaCl during curves 1 and 2 were similar: 1.05±0.09, 0.79± 0.13, 0.84±0.11, 0.85±0.10, 1.00±0.11, 1.31±0.08, and 1.39±0.04 g/20g b.w. Both groups displayed similar preference for salty HFD in curves 1 and 2. Mice from both groups avoided HFD 4 and 8g% NaCl compared to HFD 0.5g% NaCl in both curves. Therefore, FSS and ethanol intake after FSS did not modify salty HFD preference in CD-1 retired breeder mice.

6) CYTOTOXIC AND APOPTOTIC EFFECTS OF CHAGA MUSHROOM (INONOTUS OBLIQUUS) ON CULTURED 4T1 MURINE BREAST CANCER CELLS. Jake A. Brozek*, Sarah Kelly, Vianney Trujillo, Trevor Burrow, Gary O. Gray & Adam J. Reinhart. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

Previous studies in our lab have shown that extracts from several common herbs with anti-inflammatory activity have cellular components which are cytotoxic to cultured 4T1 murine breast cancer cells. In this study, extracts of Inonotus obliquus, or the Chaga mushroom, were prepared by refluxing powered Chaga in acetone (Soxhlet extraction, 1.5 hours). The extracts were distilled into ethanol, concentrated, and then fractioned via Sephadex LH20 chromatography (50% ethanol mobile phase; eluate monitored at 280 nm). The resulting fractions were assayed for cytotoxicity to cultured 4T1 cells, and the fractions pooled based upon cytotoxicity. Pooled fractions with strong cytotoxicity were further separated via HPLC (C18, 75-100% methanol gradient over 40 min.). The HPLC peaks were collected, concentrated and again tested for cytotoxicity. Analysis of the physicochemical properties of the six collected peaks is ongoing. To determine if the observed cytotoxicity was due to apoptosis, we examined expression levels of proteins involved in the activation of cellular apoptotic pathways using Western blots. We investigated expression levels of caspases 3, 6, 8, 9, and 12, along with Cleaved forms of caspases 3 and 8 and PARP. Cleavage of caspases 3 and 8 as well as cleaved PARP were elevated upon treatments with Chaga extract, suggesting cell death is due to apoptosis.
1) USING LOCAL GC PERCENTAGE TO DETECT UNUSUAL REGIONS IN BACTERIAL GENOMES. Sharon DeMerritt*, Gracia Sebastiao* & Robert Moore. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

Development of new antibiotics may include strategies such as identifying unique genes that may serve as an antibiotic target, or previously unidentified similarities between an antibiotic resistant organism and other organisms that have well-known treatments. As a new approach to find these features, we examined the genomes of 28 bacterial organisms at a “local” level to find regions that seemed dissimilar to the rest of the genome. Local GC percentages were defined as the percentage of guanine and cytosine across 210 base pairs, and these local GC percentages were calculated at 70 base pair intervals across the entire genomes of the organisms. Median and quartiles for the local GC percentages of all of the organisms were also determined. While most organisms’ local GC percentages remained within a certain range, some organisms showed interesting characteristics where this was not the case. For example Mycobacterium tuberculosis had a much larger range than the other Mycobacteria, and the bacteria from the Clostridium genus had extreme spikes in GC percentage extending as much as 20% outside of its typical range. Some of these anomalous areas of the genome could be examined to identify potential sites of horizontal gene transfer or other unique features of an organism that may lead to new targets for antibiotic development.

2) QUALITATIVE ANALYSIS OF IMPRINTING AND BONDING FOR PDMS BASED MICROFLUIDIC DEVICES. Ethan Nicholson* and Robert Moore. School of Mathematics and Sciences, Wayland Baptist University, Plainview, TX, USA.

The standard process for developing microfluidic devices (MFD) uses glass etching and oxygen plasma bonding, both of which are very costly. Polydimethylsiloxane (PDMS) is a polymer into which molds may be imprinted during curing, and therefore may serve as an alternative to glass-etched MFDs. Various imprint and bonding methods were tested to evaluate their impact on channel evenness and integrity or openness. Imprinting methods included dissolving embedded magnesium and using different types of tape to create channels in the PDMS. The bonding methods tested were bonding fully cured PDMS to fully cured PDMS, fully cured PDMS to glass and partially cured PDMS to partially cured PDMS. While there was some limited success with all of the methods tested, the most success was seen using electrical tape to create channels and bonding partially cured PDMS to partially cured PDMS to enclose the channel. The protocol will continue to be refined to improve the uniformity and openness of the channels, and the integrity of the fabricated devices will be determined by measuring the pressures and flow rates that can be tolerated. Once optimized, this could be the cheapest fabrication protocol for large channel fully PDMS based MFDs.
This baseline survey was conducted May-Sept 2016 using pitfall traps and visual encounters to determine the presence and habitat associations of Texas horned lizards in Hale and Floyd counties, Texas. A total of 25 lizards were documented, including 12 visual encounters and 13 captures. Of the 13 captured, 4 were males and 9 were females, with an average snout-to-vent length = 55.8 mm (range = 21.8-85.3 mm). Percent cover was measured using the Daubenmire cover class method, and the average percent grass cover = 7.04%, forb cover = 4.60%, litter cover = 2.88%, and bare ground = 85.84% of 20x50-cm quadrats centered on lizard locations. The height of vegetation was measured using a Robel pole, and the average height = 2.56 cm. The percent cover and height were not different between males and females nor between adults and young. All lizards were <1 m from the nearest escape cover providing total visual concealment from overhead predators.

Inhibiting tyrosinase is of interest to many medical, cosmetic, and food industries because it is the key enzyme responsible for hyper-pigmentation in humans and the browning of fruit. In order to explore possible new inhibitors to mushroom tyrosinase, the inhibitory qualities of sodium iodide (NaI) and phenylalanine were assessed by performing protein assays with a UV/Vis spectrophotometer at 475 nm. For each inhibitor, assays were performed in triplicates at varying substrate concentrations (2, 1, 0.5, 0.2, 0.1, and 0.05 mM) and varying inhibitor concentrations (0, 0.1, and 0.01 mM). The data was then plotted on a Lineweaver-Burke plot to determine each molecule’s inhibitory properties. NaI was found to uncompetitively inhibit mushroom tyrosinase (0.1 mM K_I' = 62.26 µM; 0.01 mM K_I' = 54.64 µM). Whereas phenylalanine was found to be a noncompetitive inhibitor (0.1 mM K_I = 130.4 µM, K_I' = 9.815 µM; 0.01 mM K_I = 41.47 µM, K_I' = 38.47 µM).

There are many factors that affect the growth of trees, and one of these factors include rainfall. Six different graphs were made to determine how rainfall affect tree growth, and if it does, which rainfall period affected the trees most from 1669 to 1992 in Post Oaks in the Malcom Ridge area. It was found that the rainfall of the same year affected the tree growth the most, with an R2 value of 0.3144. It was concluded that the rainfall of the same year most affects the Post Oak.
In dry, desert-like areas, similar to West Texas, it is important to see relations between precipitation and tree growth. We compared the Ring Width Index (RWI) to the Palmer Drought Severity Index (PDSI), for Douglas Fir in Spruce. The average 10 year RWI v. PDSI showed a more positive linear fit than the average 20 year RWI v. PDSI. This indicates that the lack of precipitation affects growth of these fir trees, and that if a short-term drought happens, they will be greatly affected.

In a dry climate with few trees, it can be observed how drought affect the tree’s growth, but in the case of a moist climate, it was unclear. A Short Leaf’s Pine ring width data from the Clemson Forest region was collected and compared to that same region’s drought to observe the effect it had on ring growth. Excel was used to graphically depict the relationships between the Short Leaf Pine ring widths and annual drought (PDSI) values. Average PDSI across 10 years and 20 years were constricted between -2 and 2 PDSI. As PDSI values deviated from 0 the maximum ring width decreased. During successive years of drought, ring width remained relatively the same, indicating that rainfall had little influence on the ring width.
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