

Poster #56/Biology

Title of Poster: Source and Credibility: Beginning and Advanced Engineering Students'™ Perceptions on Information Search Strategies

Presenter(s): Connor Rohan

College: Science

ABSTRACT:

This study examines how engineering students approach finding and using information as they solve their engineering projects. The investigators conducted 21 semi-structured interviews with engineering students representing a variety of majors, class standing, gender, and ethnicities. Interviews were open-coded to discover emergent themes and categories of information strategies. The upper level engineering students discussed several more techniques which aid them in finding and applying sources compared to lower level engineering students. The analysis resulted in two distinct differences between lower level and upper level students: (1) Lower level engineering students discuss searching broadly, whereas more advanced students discuss going to professional associations and technical sites. (2) Lower level students discuss using visual aspects to judge credibility, whereas more advanced students use their own subject matter knowledge as well. Results show that as engineering students progress through their education, they are able to use broader and more complex searching strategies to assist in finding information to complete their projects. First year curriculum designed to teach first year students these techniques may improve their ability to begin the search process. It is important to show students examples of when information online is not found to be credible, in order to highlight their need to evaluate.

Poster #57/Biological Sciences

Title of Poster: Age-related changes in GAD 65/67 expressing neurons in the dorsal lateral lemniscus

Presenter(s): Kristin Zabrecky, Megan Nelson

College: Science

ABSTRACT:

Presbycusis, or age-related hearing loss, can result in the decreased ability to process sound. Inhibition in the ascending auditory pathway of the brain decreases with age and is important in sound processing. The lateral lemniscus (LL) forms major inhibitory projections that are critical for shaping auditory selectivity, especially in the inferior colliculus (IC). Previous studies have shown a decrease in inhibitory neurons in the IC with age; however, the cause of this decrease is currently unknown. This study explored protein levels and neuron counts of GAD 65/67, an enzyme that synthesizes the main inhibitory neurotransmitter gamma-aminobutyric acid (GABA), of young and aged rats in the dorsal LL. It was hypothesized these regions would exhibit quantitative and qualitative differences between the age groups. Brain coronal sections of 6 Fisher 344 rats, 3 from each age group, were immunostained for NeuN and GAD 65/67 proteins and photographed with confocal microscopy. NeuN stained cell bodies also expressing GAD 65/67 were quantified using Image J software. The preliminary data analysis of neuron counts showed little differences between the animals, but more analysis is needed to look for differences in GAD 65/67 expression. These results suggest that age-related changes in sound processing may not be the result of changes in GABAergic neuron counts in the lateral lemniscus.

Title of Poster: The Role of ROS in Neuronal Motility

Presenter(s): Erica Wimer

College: Science

ABSTRACT:

At high concentrations, Reactive Oxygen Species (ROS) are known for causing oxidative damage that greatly interferes with cellular function and ultimately results in cell death. These toxic effects are due to the oxidation of lipids, proteins and DNA and are well documented in cancer, diabetes and neurodegenerative disorders including Alzheimer's and Parkinson's disease. However, physiological levels of ROS are shown to play an important signaling role in mediating differentiation, proliferation, and apoptosis. There is evidence that physiological levels of ROS are critical for neuronal cell motility and maintaining the F-actin cytoskeleton that controls outgrowth (Munnamalai and Suter, 2009). We believe that ROS has a specific signaling role in neurite outgrowth and motility. Using bag cell neurons cultured from *Aplysia*, we use Phase imaging to assess the outgrowth rates of specific neurites. Then, we use fluorescent dyes DCF and Calcein Red-Orange to analyze the volume-corrected level of cytoplasmic ROS in the corresponding growth cones. By comparing outgrowth rates and cytoplasmic ROS levels, we can begin to piece together the role that ROS plays in neuronal motility. Thus far, a direct correlation has not been found in long-term growth rates and cytoplasmic ROS levels. We are beginning to incorporate time-lapse imaging to find instantaneous growth rates and compare these with cytoplasmic ROS levels. Although very little data has been collected using instantaneous growth rates, the results are suggesting a possible correlation. Knowing how ROS affects neuronal cell growth could significantly alter the way we approach neurodegenerative diseases and the attempts to manipulate neural tissue growth.

Poster #59/Computer Science

Title of Poster: Sequence Similarity-based protein Function Prediction Visualization

Presenter(s): Qing Wei

College: Science

ABSTRACT:

The Gene Ontology is a major bioinformatics initiative with the purpose to represent the gene and gene product attributes across species and databases by providing a list of terms. For this research, we are providing visualization for researchers to quickly identify and compare gene terms' relationships. Since visualization of gene terms prediction always involve large computation and client rendering, it is difficult to maintain efficiency, usability and accuracy. Our research is focusing on developing a visualization tool for two protein functions prediction servers based on their output data with the tree hierarchy structure graph and allow user click and expand the term nodes. I approached this problem by implementing the backend query. Then I make attempts to find the best web graph visualization tool including force-directed and hyper-tree to fit the protein graph structure. After going through the tools, I determined that using a more flexible library and implement the user interactions from scratch to achieve customization, and render performance. The end result is a web application that adaptively parses the prediction into a tree hierarchy graph with gene similarity colorization.

Poster #60/Atmospheric Science

Title of Poster: Climatological Impact of Galactic Cosmic Rays on Global Cloudiness

Presenter(s): Natalie Vezina

College: Science

ABSTRACT:

/ The galactic cosmic ray " cloud condensation (GCR-CCN) hypothesis proposes a physical mechanism for the generation of aerosols in the lower atmosphere (especially during Quiet episodes of the Sun when increased spallation and ionization are more capable of producing sulfate aerosols). The magnitude of the GCR impact can be monitored by surface-based neutron counters. This research project has focused on the capability of the proposed physical hypothesis to significantly affect global cloudiness and possibly the Earth's climate. NASA's International Satellite Cloud Climatology Program (ISCCP) has provided the data for this study, consisting of global cloud amounts and type, as well as optical depth for the period 1984-2012. It has been discovered that the pattern of "deep convective cloud amounts" correlates directly with the GCR anomalies, and not the total global cloudiness or the lower tropospheric cloudiness reported in previous studies (which have not stood the test of time). This is further supported by a general decrease in total global cloudiness, yet an increase in optical depth (that can only be explained by the increase in deep convective cloudiness with its greater optical depth and the general reduction in solar activity for the past three solar cycles).

Poster #61/Microbiology

Title of Poster: Understanding protist lignocellulase activity in the digestion of wood in the termite, *Reticulitermes flavipes*

Presenter(s): Hannah Stewart

College: Science

ABSTRACT:

The eastern subterranean termite, *Reticulitermes flavipes*, and its symbionts collaborate to breakdown wood for energy. They form an efficient bioreactor that could be used to help answer the current issue of utilizing renewable energy sources. It is known that bacteria and protists in the hindgut synergize with their host for the digestion of lignocellulose. Additionally, the removal of bacteria from the termite hindgut with antimicrobial treatments reduces, but does not abolish, lignocellulase activity. The goal of this work was determine to what extent protists were affected by the removal of bacterial symbionts following antimicrobial treatments. The hypothesis was that protists would be negatively affected by the removal of bacteria. To test this hypothesis, I fed termites antimicrobial laced food for a week, removed their guts, extracted RNA and looked at gene expression of four protist lignocellulases using qPCR. Gene expression data showed that each gene had a unique expression pattern in a given treatment. Thus, some genes supported my hypothesis while others refuted it. This suggests that both bacteria and protists play vital roles in termite digestion. My data highlight that termites and their symbionts should be considered together when trying to find novel sources of enzymes for biofuel applications.

Poster #62/Biological Sciences: Health & Disease

Title of Poster: Study of Coronavirus Protease Using CFP-YFP Fluorescent Assay

Presenter(s): Caitlin Specht

College: Science

ABSTRACT:

Middle Eastern Respiratory Syndrome (MERS) is an emerging viral disease originating in the Arabian Peninsula with a current mortality rate of nearly fifty percent throughout Europe and Asia according to the World Health Organization. Like Sudden Acute Respiratory Syndrome (SARS), it is a coronavirus thought to be a zoonotic virus initially transmitted to humans from an animal host. Characterization of this disease is being done to determine the basis of viral replication and mode of transfer in order to identify druggable pathways in the virus life cycle. One such target for viral inhibition is the proteases responsible for cleaving the polyproteins initially transcribed from the (+) strand RNA immediately following infection. Once cleaved, the sub-components of the polyprotein compose the viral replication complex. Without these proteases viral replication cannot occur, making them a prime target for viral replication inhibition. First, replication proteases were characterized using a fluorescence resonance energy transfer (FRET)-based substrate by measuring the amount of fluorescence emitted as a result of enzymatic activity. Each polyprotein cleavage site linked two fluorescent proteins that absorb light at a specific wavelength, transfer energy to the other protein, and emit light at a higher wavelength.. When the FRET substrate is incubated with the enzyme that targets the cleavage site, the fluorescence emitted at the higher wavelength decreases proportional to the amount of substrate cleaved, allowing a cleavage rate to be calculated. Based on the calculated cleavage rate, kinetic calculations were performed to analyze enzymatic activity. The results of these experiments will allow a comparison of replication proteases from MERS with replication proteases from other coronaviruses. Further analysis will be done to measure the cleavage rates of different coronaviruses. This study produces conclusive results for the characterization of MERS replication proteases that are essential in further development of inhibitor molecules.

Poster #63/Computer Science

Title of Poster: Managing Large-Scale Data Centers from Smartphones

Presenter(s): Raghav Shankar

College: Science

ABSTRACT:

Systems management of commercial data centers is a daunting task because they contain a large number of machines that need to be kept operational almost 24X7. It is important that system administrators are able to manage individual target machines and identify potential problems in order to reduce system downtime. Today this is done by administrators sitting at their desks in front of large screens attached to desktop-class computers. The emergence of mobile platforms presents an opportunity in the way data centers can be monitored. Mobile platforms such as smartphones allow system administrators to remotely manage the activities of commercial data centers. For example, the system administrator can observe the trends in the system utilization and failure signals and optionally, take some corrective actions, such as, rebooting a server. We evaluate the functionality of current solutions, which indicate that they utilize excessive resources on the mobile device and limit system administrators from efficiently monitoring data center activities. In our research, we propose a system that allows system administrators to efficiently manage data center machines using mobile devices. The system consists of a middleware software which interacts with the target machines and a mobile application that the system administrators interact with. This is work done jointly with IBM and is demonstrated on IBM Blade Center-based data centers.

Poster #64/Biochemistry (ACS)

Title of Poster: Fluorescence-Guided Surgery for Prostate Cancer

Presenter(s): Carrie Myers

College: Science

ABSTRACT:

Current surgical techniques for cancerous tumor removal depend mostly on the surgeon's naked eye. However, cancer tissue can look similar to normal tissue and some cancers develop many small, scattered lesions instead of a single mass; this makes this strategy for removal very difficult, resulting in incomplete removal during surgery. Fluorescence guided surgery is a new idea in this field that is gaining strength through its improvements in cancer tissue detection and removal. Many different cancers show differences in their physical properties compared to surrounding tissue, thus giving us an opportunity to selectively target and image them using a fluorescent probe. For prostate cancer, this physical difference is the over expression of prostate specific membrane antigen (PSMA). A developed ligand for this receptor, 2-[3-(1,3-dicarboxypropyl)ureido]pentanedioic acid (DUPA), when conjugated to a fluorescent dye, selectively targets, enters, and illuminates these cells. In this study, localization of a fluorophore to prostate cancer cells is analyzed in vitro and in vivo and a comparison is made between compounds differing in their linkage between the DUPA ligand and the fluorophore in the molecule. The compound, DUPA-8aminooctanoic acid-phenyl-tyrosine-SO121 (NIR dye), was chosen to be the best out of those tested due to its high affinity for 22RV1 (a human prostate cancer cell line that over-expresses PSMA), higher fluorescence intensity in in vivo whole body imaging (about 10 times brighter than other compounds tested) and specificity for cancerous tissue over normal tissue.

Poster #65/Geology & Geophysics

Title of Poster: Insights into North American Evolution Derived from Crustal Structure Across the Nd-line

Presenter(s): Austin McGlannan

College: Science

ABSTRACT:

We investigate crustal structure across the Nd-line, a Proterozoic geochemical and geophysical boundary within the mid-continent of North America to learn about the growth and evolution of continental crust. The Nd-line marks the boundary between crustal rocks that formed from differing crustal and mantle sources. The rocks northwest of the boundary have Nd-model ages greater than 1.55 Ga while those to the southeast have ages less than 1.55 Ga. The location of the Nd-line also correlates with a change in long-wavelength magnetization. Using data recorded by EarthScope Transportable Array stations, we calculate receiver functions to investigate the thickness and structure of the crust. These observations can be used to identify whether structural changes exist across the Proterozoic boundary. Our observations reveal that while the crust generally exhibits a similar thickness of 45 km on either side of the Nd-line, a trend of thicker crust ~ 50 km, runs parallel to the boundary. The zone of thickened crust along the boundary appears to mark a zone of crustal thickening that occurred during accretion, and suggests that features associated with continental growth endure at lower crustal depths. South of the Nd-line, patterns of crustal thickness coincide with current physiographic regions such as the Ozark Plateau, where the crust averages 43 km thick, and the Reelfoot Rift, where the crust thins to ~ 40 km. These crustal patterns appear to reflect more recent lithospheric deformation, suggesting that structures in the mid- and lower-crust appear to have been shaped by more recent tectonic events.

Poster #66/Atmospheric Science

Title of Poster: An Assessment of the Extreme 2011 USA Tornado Season

Presenter(s): Alexandra Marmo

College: Science

ABSTRACT:

The year 2011 was the most deadly tornado season in the USA modern tornado record (1950-present). Tornado events for 2011 have been studied and compared to tornado statistics for the first decade of this century, to show the extreme features of this record setting season. Although this extreme season experienced only slightly above average number of tornadoes, it achieved record accounts for a) the intensity scale (six EF5s and 17 EF4s), b) the number of deaths (562), c) average path length for the significant tornadoes, EF2 to EF5, from 9.3 miles to 52.6 miles, with one EF5 that tracked for 132 miles. Many of the significant tornadoes occurred in outbreaks on April 25-28 and May 31. This study has shown the efficacy of the significant tornadoes to produce record fatalities for all intensity scales, including more than 300% greater than average for the EF3, EF4, and EF5 scales. It is further noted that nearly twice as many tornado deaths occurred in homes, compared to mobile homes, which is highly atypical in tornado fatalities. The probability of one or more deaths for the EF5 scale was 1.0, and the probability of a given death for a tornado event is associated with the EF3 scale, due to a combination of their intensity and the relative large number of events.

Poster #67/Chemistry

Title of Poster: the DNA nanomotor

Presenter(s): Yang Liu

College: Science

ABSTRACT:

Nanomotors consisting of single protein molecules are abundant in living systems. Here we report a nanomotor made of a single DNA molecule. The DNA nanomotor can adopt two distinct conformations, intramolecular tetraplex and intermolecular duplex. The nanomotor switches between the two conformations through alternating DNA hybridization and strand exchange reactions, which enables the nanomotor to perform an inchworm like extending[^]shrinking motion. When the single molecule nanomotor is loaded with two organic molecules, a fluorophore and a quencher, the motion can be viewed in real time by monitoring the fluorescent signal. The DNA nanomotor functions efficiently both in solution and on nanoparticle surfaces. Its simple yet stable structure, convenient operation, and high efficiency may make the DNA nanomotor practically useful for powering nanosystems in future applications.

Poster #68/Biological Sciences-Health and Disease

Title of Poster: Enhanced isoprene production by the isolation of mutants in carbohydrate metabolism in the cyanobacterium *Synechocystis* sp. PCC 6803

Presenter(s): Jasleen Kaur

College: Science

ABSTRACT:

Enhanced isoprene production by the isolation of mutants in carbohydrate metabolism in the cyanobacterium *Synechocystis* sp. PCC 6803 / Jasleen Kaur, Xiaohui Zhang and Louis A. Sherman / Dept. Biological Sciences, Purdue University, West Lafayette, IN 47907 / Cyanobacteria have a great potential to use sunlight and atmospheric carbon dioxide to make valuable bio-fuels. One such compound is isoprene. Isoprene is a major constituent of rubber, which is currently produced from petroleum. Through this research, we intend to create a model for the productions of isoprene gas with the help of the cyanobacterium, *Synechocystis* sp. PCC 6803. This is a photosynthetic microorganism that has an excellent genetic system and which stores carbon in glycogen granules. We are constructing mutants in *Synechocystis* sp. PCC 6803, by blocking the function of the *glgA1* and *glgA2* genes, the two glycogen synthase genes, thus blocking the carbon flow towards glycogen storage, and enhancing the carbon flux towards the MEP pathway. Along with *glgA1* and *glgA2* mutants, we are also constructing site-directed mutants in the phosphoribulosephosphate (PRK) gene to lower PRK activity. This is an important gene in carbon dioxide fixation and we needed to retain PRK activity, but reduce it by about 75%. We are beginning to characterize the 4 PRK mutants. The in-vitro activity is 20-80% depending on the amino acid changed. We are now introducing the isoprene synthase gene to these mutants, and this gene is expressed by the strong *psbA2* promoter. These mutants then will be combined to measure further effect on the production of the isoprene. We will show our progress towards the goal of enhanced bio-fuel production.

Poster #69/Chemistry

Title of Poster: Improving Rational Drug Design with Protein-scaffolding Ligands

Presenter(s): Henry Hamann

College: Science

ABSTRACT:

High-quality protein crystals for use in structural analysis via X-ray crystallography have become increasingly important since the advent of structure-based drug design approaches. Determining high-resolution protein structural information relies on the production of relatively large, defect-free, single crystals and, despite advances in the production of such crystals, this step is still a major limitation in the pharmaceutical development process. A large number of experimental variables can affect optimal crystallization conditions including temperature, pH, buffer, salinity, precipitant type and concentration. Proper crystals are difficult to obtain due to structural flexibility of protein targets and the lack of universal, reliable methods for crystallization. These challenges reflect the need for continued development of improved strategies for the production of high-quality crystals. The aim of this research is to use rigid, symmetrical nucleating ligands to facilitate production of diffraction-quality protein crystals, using green fluorescent protein as a model. These ligands are designed to non-covalently link protein molecules together to provide a scaffold and promote nucleation, followed by ordered assembly. We hypothesize that by using these ligands, nucleation can be initiated faster, lower protein quantities will be required, and crystallization can be achieved under a wider range of conditions, even those which do not typically promote growth. Further, we expect these ligands to be useful as a rational tool in achieving high-quality crystals for protein structure elucidation.

Poster #70/Genetics, Statistics

Title of Poster: Mutations Changing Transcriptional Control of the ProU Operon in *Salmonella typhimurium*

Presenter(s): Jennifer Franks

College: Science

ABSTRACT:

In high salinity environments, cells must be able to maintain equilibrium between internal and external osmolarity. Accumulation of uncharged solutes is one mechanism for coping with high external osmolarity. In *Salmonella typhimurium*, the ProU transport system is responsible for the uptake of uncharged solutes, such as proline. The proU operon is induced by high osmolarity. No transcriptional activators or repressors have been identified yet for proU. The purpose of this project is to obtain mutations that affect transcription of proU in hopes of identifying and characterizing the regulatory machinery for this operon. / A strain of *Salmonella typhimurium* that contains a proU-lacZ reporter fusion was used for this experiment. The strain was mutagenized with the alkylating agent, ethylmethanesulfonate, and a derivative that expressed the proU-lacZ fusion at elevated level was selected. P22 phage mediated mapping confirms that the mutation causing Lac⁺ behavior is neither within nor nearby the promoter region of the proU operon. These preliminary findings indicate that an uncharacterized regulatory gene may be affected by mutation. Further research was conducted to pinpoint the location of the mutation and its exact nature.

Poster #71/Biochemistry

Title of Poster: Logic patterns for finding functionally related genes in Escherichia coli

Presenter(s): Tiange Dong, Linzi Chen, Weichuan Luo

College: Science

ABSTRACT:

Elucidation of gene function is a central problem in molecular biology. Usually gene function is determined by experiments and database search. However, this method is very time-consuming, laborious and costly to analyze every gene in a genome. Applying the method of logical computing, we contrive a program that uses many different reduced binary logic expressions to generate gene pairs and triplets in order to find the intrinsic biological property of these logic patterns. The logic patterns are designed to represent the presence or absence of genes across different genomes of Escherichia coli. By computationally and manually checking biological relations of expressed products of gene pairs and triplets, we are able to examine whether the logic patterns are reasonably representing the corresponding biological relations. For certain logic expressions, they gave relatively good positive results percentage. Moreover, we noticed that some logic patterns have high percentage of positive hits over certain types of relations. This novel method will allow us to better understand how genes interact and what type of relations they have. It could ultimately lead us to predict function of uncharacterized and conserved genes.

Poster #72/Physics

Title of Poster: The Rheology of Acoustically Fluidized Sand

Presenter(s): Jack Conrad

College: Science

ABSTRACT:

There are current gaps in understanding the rheology of vibrated granular material (sand in this case) as a function of stress, frequency and amplitude of the vibrations in the sand itself. We constructed a rotational viscometer to quantitatively investigate the relation between the stress and strain rate in a horizontal bed of strongly vibrated sand. In addition to the macroscopic strain rate, the amplitude and frequency of the vibrations produced by a pair of pneumatic vibrators were also measured with the aid of miniaturized piezoelectric accelerometers (B&K) whose output was recorded on a digital storage oscilloscope. The initial gathering of the experimental data was difficult due to granular memory, but by having the sand compacted vibrationally for 8 minutes before each run the scatter of data was reduced and we were able to obtain consistent results. We find that vibrated sand flows like a highly non-Newtonian fluid, in which the shear strain rate is proportional to stress to a power much greater than one, where the precise power depends on the amplitude and frequency of the applied vibrations. Rapid flow occurs at stresses less than half of the static yield stress (that is, the yield stress when no vibration is applied) when strong vibrations are present. This demonstrates that vibrated sand behaves as a strongly nonlinear pseudo-plastic material that can also be approximated as a Bingham material with a rate-dependent yield stress. The flow of acoustically fluidized granular materials provides a reasonable explanation for crater collapse and long runout landslides.

Poster #73/Molecular Biology

Title of Poster: Mechanistic Studies of a Clinically Relevant Bacterial Transporter

Presenter(s): Dhruv Bole

College: Science

ABSTRACT:

The ATP-Binding Cassette, or ABC transporter, is a group of diverse proteins involved in numerous diseases including genetic diseases such as cystic fibrosis, multidrug resistance bacteria, and cancer. The ribose transport complex in bacteria may serve as a model for how these transporters work in vitro. The purpose of this study is to determine how ATP hydrolysis morphs the complex from an "open" to a "closed" position. To determine the configuration of the proteins, ribose transport complexes associated with sequential stages of the transport cycle were isolated in the presence of different substrates, and by adding strategic mutations these complexes were studied using Electron Paramagnetic Resonance (EPR) spectroscopy to observe how protein interaction affected their formation. The results below show ribose interactions of the transmembrane domain (TMD), RbsA, with different variations when Mg²⁺, vanadate, and ATP are added. These results suggest that the complex "opens" up when those three components are added together. Future experiments include how ribose interactions of TMD, RbsC, associate with ribose-binding protein RbsB, which in turn interact with nucleotide binding-domain RbsA. This clinically relevant complex could give us further insight to how these ABC transporters transport molecules to and from the cell.

Poster #74/Physics, Chemistry/Biochemistry

Title of Poster: Free Standing Semi-Flexible Composite Carbon Nanofiber Oxide Films Using Functionalized Carbon Nanotubes and Polyvalent Crosslinking Ions

Presenter(s): Carlos Blanco

College: Science

ABSTRACT:

Historically, conjugated carbon nanomaterials, such as carbon nanotubes and graphene, have been studied for their electronic properties and applications in supercapacitive devices. In recent years, carbon nanofiber (CNF) has come under increasing study due to the similarities between the molecular structures of carbon nanotubes and graphene. CNF is a nanostructure derived from the graphene carbon allotrope, in which a stack of graphene "nano-cones" are held together to form long fibers. Its molecular arrangement consists of sheets of SP² hybridized carbon atoms forming large, interconnected conjugated pi systems above and below the molecular plane. This allows for transverse delocalization of electrons and leads to an electronically active material with many possible configurations. However, due to its low surface area and its inability to form colloidal suspensions, CNF can be regarded as an unfavorable material to work with. By functionalizing CNF into carbon nanofiber oxide (CNFO), subsequently exfoliating, and reducing the fibers, the electronic properties are largely maintained, while allowing the material to form colloidal suspensions and increasing its structural stability. Stabilizing such a material into workable films would allow its use in electrical double layer capacitors among other applications.

Poster #75/Biology

Title of Poster: Characterization of VGluT2-positive axon terminals in MGB of young and aged rats

Presenter(s): Elizabeth Alperin, Eric Pujari, Sarah Kober

College: Science

ABSTRACT:

Age-related hearing problems can result in deficits in differentiating foreground and background noises, although the underlying mechanisms in the central nervous system are not fully-characterized. The sounds we hear are processed in the ascending auditory pathway through several layers of informational identification and extraction. One layer contains the Medial Geniculate Body (MGB), where excitatory message inputs from the Inferior Colliculus (IC) can be identified by the presence of glutamatergic synapses containing Vesicular Glutamate Transporter 2 (VGluT2). We hypothesize that the decreased hearing ability of aged rats correlate to fewer excitatory axon terminals in the MGB, which is known to have different characterizations for the dorsal, ventral medial, ventral, and ventral lateral divisions based on structure and function. In an attempt to better understand the age-related changes in the auditory system during aging, VGluT2-positive axon terminals in the MGB subdivisions of young adult and aged Fischer 344 rats were labeled and the areas and density of these terminals were quantified using image analysis software. Preliminary data shows a decrease in density with age for all subdivisions along with a decrease in size for the ventral subdivisions and an increase in size for the dorsal division. Further analysis is needed to increase sample sizes and further identify trends.