
UGRC06 Program

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10:00 AM

Shem Thompson

Physics

Comparing Constituent Fluxes of Students into and out of Physics Majors

More students leave physics for non-physics majors than visa versa. We surveyed a number of students to pin point their initial reasons to major in physics and their reasons for then leaving physics as a major. Our survey was patterned after Elaine Seymour's research in her book "Talking about Leaving" which addresses the issue of attrition in Science, Mathematics, and Engineering majors. We have found some interesting results by comparing the answers of those students who left physics as a major, those who left a different major for physics, and those who have stayed in physics.

10:15 AM

Amanda Brighton, Steven Gardner

Physics

Do You Know if You Know?

Two typical introductory Physical Science classes were asked to give answers to five questions about motion. An additional question was associated with each of these five questions to ascertain how confident each student was in their answer. The student's metacognitive ability to determine correctly what they know or do not know was evaluated. The student's inability to self-assess understanding was as common as the converse. When the data was analyzed by gender, attempting to identify differences between males and females in terms of this metacognitive skill, no statistically significant difference was found. Additionally, we identified widespread alternate conceptions when large numbers of students were very confident in the same incorrect answer. These findings confirm previous studies regarding misconceptions in this area.¹

1 A. Arons, Teaching Introductory Physics, Wiley (1997) p.37

10:30 AM

Carson Fenimore

Computer Science

NSNSDSDS: A Software Implementation for Receiving Position Tracking Signals

The Automatic Position Reporting System (APRS) allows citizens to broadcast GPS coordinates that may be tracked by anyone. These coordinates are received using an array of hardware, typically consisting of a radio scanner, Terminal Node Controller, and computer. This paper presents software Digital Signal Processing techniques that replace the functionality of a Terminal Node Controller, thereby reducing the cost of constructing an APRS monitoring station. It describes the process of correlation using the Discrete Fourier Transform, windowing techniques, differential decoding, and symbol synchronization. This paper also describes how this software was applied to NASA RISE meteorological balloon launches at BYU-Idaho; it concludes by detailing how the software interfaces with the APRS visualization software developed by Jacob Christensen for these launches.

10:45 AM

Jacob Christensen

Computer Science/Engineering

Near Space Balloon Tracking

This paper addresses the problems associated with developing a wireless tracking device, such as selecting a wireless medium, finding a computer capable of running the hardware (i.e. GPS unit, sensors, radio), and perhaps the most challenging of all, finding a practical way to view the data from the balloon. The solution I developed to visualizing the data is called Thor Trak. Thor Trak consists of three modules. The first module pulls data from the radio hardware. The second module breaks up the data into longitude, latitude and altitude. The third module then writes these coordinates into an XML file that is read by Google Earth© and graphed in three dimensions. This paper constitutes a working knowledge of the basics of wireless tracking with a focus on Thor Trak, the software used in the NASA RISE near space balloon

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launch last semester.

11:00 AM**Christopher Vanderbeek***Biology***Scientific Evidence of the Genetic Factor of Migraines**

The main question this research paper covers is what does scientific research show about the factor that genes play in migraine expression? Scientists use three main types of studies to assess the genetic factor of migraines: family studies, twin studies, and genetic linkage studies. Family studies have been important in showing the pattern of migraine expression in families. Twin studies have been important in distinguishing between the environmental and genetic factor of migraines. And genetic linkage studies have located parts of genes that are linked to migraine expression. Each study has provided researchers with significant evidence of the genetic influence in migraine expression. Many sources conclude that half of migraine expression is due to genetic influence. Although many important discoveries have been made through each of these studies, researchers are still working to know the specific genetics of migraine and how it is inherited.

11:15 AM**Steven Wyler***Biology***Soluble DNA as a Target for PCR Detection and Identification of Aquatic Organisms**

All cells release DNA when they die, but detection of rare DNA targets (e.g. < one molecule per ml) requires concentration before amplification. Soluble DNA (sDNA) can be recovered and concentrated from water through anion exchange and used as a template for detection and identification of any biological target. Extraction and concentration of sDNA (0.2 μ m filtered water) from three separate water sources was attempted: two mesothermic springs and a fish run. The two warm springs failed to yield any detectable DNA or amplifiable bacterial target. The fish run, which contained fry from several species including *Oncorhynchus mykiss* (rainbow trout) yielded DNA at 94 ng/l. The major histocompatibility complex of rainbow trout was amplified from the DNA concentrate. The utility of this approach for bio-monitoring is applicable to all DNA sources, is scalable to extremely rare targets, and should be quantifiable within narrow limitations. Research was funded by NIH P20RR16454.

11:30 AM**Tamara L. Duncan***Chemistry***Efforts Towards the Total Synthesis of Gambieric Acid-A**

The synthesis of the J-sidearm and A-ring portions of gambieric acid-A and the proposed synthesis of D-allal for the study of diastereoselective oxidation of cyclic enol ethers.

11:45 AM**Christina Velton***Chemistry***Hypothesis driven synthesis of isoxazoles**

This experiment involved the synthetic derivation of isoxazoles. In doing so, we hope to determine the Structure Activity Relationship (SAR) of metabotropic Glutamate Receptors (mGluR) and the system xC Transporter.

10:00 AM**Brian Conary***Spanish***The Modern Day Tower of Babel: Diachronic Adaptation from Latin to Spanish**

Many studies of the progression of Latin to Romance to Archaic Spanish to Modern Spanish have been performed. (1) In my Spanish 490 R class, I am presently investigating the phonological changes that occurred from Latin to Modern Spanish. Some areas of interest include; letters can represent more than one sound; the same letter does not always represent the same sound/sounds throughout time (even in the same language); temporal, societal, social, and geographical factors change languages. I will show this by comparing Luke Ch. 3 in Latin to its equivalent in the Spanish Bible through various time periods.

(1) Penny, Ralph. *A History of the Spanish Language*. Cambridge University Press. New York. 2004.

10:15 AM**Matt Hull***Spanish***Spanish came from what?: The development of a Romantic language**

Contemporary Spanish is known by many to be part of a group of languages known as the Romance languages. But what does that mean? How can any language be romantic? In discussing linguistic changes throughout time we discover changes in pronunciation, orthography, and syntax. This past semester we have discussed the history of the Spanish language, in these areas, as it has derived from Latin. Thus exploring its Romantic roots - that is, from Rome.

10:30 AM**Peter Mifflin***Spanish***Vulgar Latin and Modern Spanish**

What role did linguistic variation in the transition from Vulgar Latin to Old Spanish to Modern Spanish? Since there are no known audio recordings of Vulgar Latin as it was spoken when it arrived on the Iberian Peninsula; it is necessary that certain trends in variation be inferred. The main thrust of the research will come from a comparative analysis of the Vulgate text of the New Testament compared against the Old and Modern Spanish versions of the Bible.

10:45 AM**Adam Clark***English***Faulty Theories and Skewed Observations:
The Origins of the Debate between Creation and Evolution**

A heated and ongoing debate exists between creationists (who believe that a divine being crafted the universe) and evolutionists (who believe that everything came into existence through natural processes). Because creationists adhere to theology and evolutionists adhere to science, no definitive test can be conceived that will conclusively falsify one side or the other, and thus end the conflict. However, a compilation of old and new commentary on the subject shows that the conflict between the two theories only exists as the product of assumptions on both sides.

Both creationists and evolutionists have their own theories as to the process of the earth's formation, each theory based on certain observations. These theories and observations are based upon certain assumptions from both sides, some of which are logically cohesive, and some of which are internally unsound. When these assumptions are addressed, the faulty ones can be laid aside, and the respective observations of science and religion, which now appear to contradict each other, fall into harmony, and one theory can be explored which fits all observations.

11:00 AM**Candice Humpherys***Physics***Threatened Because of Gender?**

A good deal of research has been done on the issue of stereotype threat. (1, 2) This research proposes that if a person

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identifies with a group of people that is negatively stereotyped for performance, then they will not perform as well as someone from the same group of people who is not made aware of the negative stereotype. The research we conducted investigates the legitimacy of stereotype threat based on gender in the area of science in the BYU-Idaho student population. Our results have significance in the current national debate about the lack of women pursuing careers in scientific disciplines.

1 Quinn, Diane M.; Spencer, Steven J.. (2001). The Interference of Stereotype Threat With Women's Generation of Mathematical Problem-Solving Strategies. *Journal of Social Issues*. 57(1):55-71.

2 Schmader, Tony, & Johns, Michael. (2003). Converging Evidence That Stereotype Threat Reduces Working Memory Capacity. *Journal of Personality and Social Psychology*. 85(3):440-452.

11:15 AM**Emily Keister***Child Development***Examining the Relationships Among, and the Effects of, Feminism, Attitudes towards Abortion, and Dual-Earner Households on Marital Happiness**

Little is known concerning how feministic attitudes and one's marital happiness are correlated. However, the feminism movement has affected the family by attacking traditional gender roles of parents. This study hypothesized that individuals who held more feministic views (e.g. a preschool child is not likely to suffer if his mother works) would be less happy in marriage. This study utilized multiple regression to study the relationship among several variables, including marital happiness and feminism. Although none of the hypotheses were supported, this study found that age is an important variable when considering levels of marital happiness. This study also found that women's attitudes towards abortion and working outside the home are not high indicators of marital happiness. Future studies could operationalize "feminism" and "happiness" differently.

8:00 AM**Carson Fenimore, Jacob Christinsen,** *RISE***Brandon Brodhead, et al.****Reaching the Space Shore: BYU-Idaho's Entry into the NASA RISE Program**

Numerous challenges are presented when constructing a high-altitude balloon capsule capable of reaching over twenty miles in the air. These capsules gather sensor data, transmit their location using long-range digital wireless networks, and provide aerial photos and video of the earth. Typically, such capsules are fairly expensive and are therefore expected to return safely to earth to be reused. BYU-Idaho has just begun constructing a high-altitude program, which is now NASA funded. This poster presents our program's approach to constructing inexpensive and innovative high-altitude platforms. It shows data and pictures gathered from the last two flights, as well as the custom software and hardware solutions used. It also depicts the design of the currently planned launch.

William Hokanson *Geology***Understanding the Movement of Nitrates in Ground Water of the Eastern Idaho Snake River Plain Using Maps Derived from Driller's Logs**

Water samples collected near Ashton, Idaho contain concentrations of nitrates that exceed EPA MCL guidelines. The distribution of wells yielding samples with high concentrations of nitrate initially appears to be random. To understand the stratigraphy of the subsurface, driller's logs, obtained via the Internet from the Idaho Department of Water Resources were examined. A table was created from the elevation of the lithologic breaks using sea level as the datum. Elevation boundaries were defined on the basis of rock type, color, and fracture characteristics provided in the driller's logs. Generalized subsurface maps were created for the different rock units. Major rock units identified were unconsolidated alluvium, basalt flows, and felsic volcanics. The maps will aid in understanding migration pathways of nitrates in the subsurface and help explain the apparent pattern of nitrate contamination in wells.

Amanda Boyd *Biology***NESTING HABITAT TYPIIFICATION: RED-TAILED TROPICBIRD *Phaethon rubricauda* ON MIDWAY ATOLL.**

Red-tailed tropicbirds (*Phaethon rubricauda*) are pantropical pelagic birds which nest on Midway Atoll (National Wildlife Refuge). Red-tailed tropicbirds nest in both the native Naupaka (*Scaevola sericea*) shrublands and the introduced Ironwood (*Casuarina equisetifolia*) forests. Nest site characteristics were compared between the two different habitats types. Nest density was also determined for each habitat type. Nest density varied between the Naupaka shrublands and the Casuarina forests (51/Ha vs. 18/Ha). Other nest characteristics which include aspect, temperature, and nest proximity to edge of plant, also varied in the 77 nests sampled. We suggest that in the future a survivability study be conducted to further understand the differences of nesting Red-tailed tropicbirds in the two different habitat types.

Holly Morgan *Biology***DENSITY AND SEED BANK OF *VERBESINA ENCELIOIDES* ON MIDWAY ATOLL NATIONAL WILDLIFE REFUGE.**

Golden Crownbeard (*Verbesina encelioides* Family: Asteraceae) is a highly invasive annual plant species on Midway Atoll (USFWS National Wildlife Refuge). Golden Crownbeard occupies approximately 70% of the 1600 acres of the refuge. Densities varies from <1 ind/M² to 282.4 ind/M². Various techniques have been used to reduce densities with hand pulling being the most common. The purpose of this study is to evaluate the effect of hand pulling on density of re-growth and the seed bank of Golden Crownbeard in selected plots. Germination tests were also performed on fresh and seed bank material to evaluate the productivity of the seed bank. Hand pulling has showed to have no significant difference in re-growth density from one year to the next when compared to untreated sites. Density of the seeds bank showed a significant reduction ($\alpha = .15$) between treated and untreated sites. This might be indicative of depletion in the seed bank over time.

Jordan Nielson *Biology***YELLOWSTONE CUTTHROAT TROUT POPULATION ASSESSMENT: TETON RIVERHEADWATERS**

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A quantitative assessment of trout populations from fifteen headwater creeks of the Teton River was performed during the summer of 2005. Using backpack electrofishing units, 100m of each stream was sampled every 2 km starting from a random point within 1 km of the Caribou/Targhee National Forest boundary. At one out of every three sample sites, a multiple pass survey was done to extract capture efficiencies in order to determine population numbers at all sites. Species abundance and size of individuals was also noted. Using the population numbers extracted, comparisons were made with the population numbers from 1998/1999 IDFG surveys. Four streams have only Yellowstone Cutthroat Trout (YCT) (*Oncorhynchus clarki bouvieri*). Eastern Brook Trout (*Salvelinus fontinalis*) comprised 75% of the trout populations in nine of the streams. Where Cutthroat Trout and Brook Trout co-exist, Brook Trout is the dominant trout species. YCT populations showed dramatic declines since 1998/1999 surveys in 5 streams and show stable populations in 3 of the streams studied.

Makayla Montero

Biology

Identification of Cytosol Proteins as Targets in Anthracycline Cardiotoxicity

Cardiotoxicity of daunorubicin limits its therapeutic use in treating cancer patients. Proteins that may mediate daunorubicin cardiac toxicity were identified in cytosol from left ventricle of four different groups of rats. Rats were treated either with saline, daunorubicin, ICRF-187 (a daunorubicin cardioprotectant), or daunorubicin plus ICRF-187. Two dimensional gel electrophoresis was performed on cytosols from each group at pH 5-8. Proteins that were down-regulated in the daunorubicin treated gel but returned to control density in the daun+ICRF treated gel were extracted using in-gel tryptic digestion methods and proteins identified by tandem mass spectroscopy. Proteins identified using LC/ESI/MS/M were albumen and dehydrogenase B; this work funded in part by NIH P20RR16454 and MSTMRI.

Kwang ho Ha

Biology

Elucidating the role of calpain I cleavage of α -synuclein in Parkinson's disease and dementia with Lewy bodies

Parkinson's disease (PD) and dementia with lewy bodies (DLB) are both neurodegenerative diseases characterized by motor dysfunction and dementia with loss of cognitive skills, respectively. While distinct in their clinical presentation, both PD and DLB share a common pathological feature: the presence of neuronal inclusions termed lewy bodies (LBs) consisting of a 140-amino acid protein, α -synuclein (α -syn). A key step in the development of LBs is the fibrillization of α -syn following its abnormal turnover by, as yet unidentified, proteases. The present study is aimed to determine whether calpain I, a ubiquitously expressed protease, is able to cleave α -syn in vitro and in vivo. Using Western blot analysis and immunohistochemistry, it was demonstrated that calpain I is able to cleave α -syn. Based on our preliminary results, we provide evidence that calpain I may be a candidate protease involved in modifying α -syn, leading to the formation of LBs in vivo. This work was funded by NIH-P20RR016454.

Patrice McNulty

Biology

Innate Immunity of the nematode *C. elegans*

All organisms face constant exposure to pathogens which they must defend themselves against. As a result, an innate immune system evolved very early and is conserved throughout phyla. The innate immune system can be very complex and difficult to study in large organisms, therefore an invertebrate model was chosen. *C. elegans* was chosen as the model because it is easy to grow and maintain, has a short generation time, reproduces hermaphroditically, and is transparent for easy microscopy. The worms were infected with a newly isolated species, *Pseudomonas fluorescens* strain ISU3, over a 16 hour period and were stained with Evans Blue to detect damaged cells. It was found that increased concentrations of lipoic acid, an antioxidant, increased necrosis of cells in the worm. This indicates that reactive oxygen species may play an important part in the innate immunity of *C. elegans*. This gives us more insight into the defenses of *C. elegans*, and may lead to more insight on the innate immunity of more complex organisms.