

possible health benefits. In order to compare the antioxidant profile of different varieties of high bush blueberries growing in differing conditions, several methodologies were tested. We found that two different UV-Visible spectroscopy-based measures of antioxidants were manageable for testing large numbers of berries. These are the FRAP assay (ferric ion reducing antioxidant power) and the Folin-Ciocalteu assay of total phenolic compounds. Our initial findings with these two assays indicate that Duke and Jersey varieties are lower in antioxidants than Blue Crop and Blue Gold. Several methods for HPLC quantification of acid hydrolyzed anthocyanidins were also tested; here we report the most successful extraction, hydrolysis and chromatography method. These three measures provide quantitative analysis of antioxidants in blueberry cultivars. Each method was developed to the point of functional use, and will be used to determine health of organically grown blueberries and compare them to conventionally grown blueberries. (Supported by USDA Specialty Crop Grant #2011-546)

ABUNDANCE OF APPETITE REGULATORY FACTOR mRNA IS INFLUENCED BY 3-HOUR FEED WITHDRAWAL IN CHICKENS SELECTED FOR HIGH AND LOW BODY WEIGHT. W. Zhang, L. A. Nelson, P. B. Siegel, M. A. Cline, & E. R. Gilbert, Department of Animal and Poultry Sciences, Virginia Tech, Blacksburg, VA 24061. Long-term (55+ generations) selection for low (LWS) and high (HWS) body weight in chickens has resulted in a 10-fold difference in body weight at selection age and correlated responses in appetite and body composition. Some of the LWS are anorexic, while HWS are hyperphagic and obese. We hypothesized that differences in appetite regulatory factor mRNA between the lines would be accentuated by food withdrawal. Five-day old male LWS and HWS chicks (n=24) were randomly divided into 2 treatments; 1) continuous access to a starter diet or 2) 3 h feed withdrawal, after which hypothalamus was collected. The mRNA abundance of *AGRP*, *NPY*, *NPYR1*, *MC4*, *GLUT1*, and *FOXO1* was measured by real time PCR. Data were analyzed by ANOVA using the Glimmix procedure (SAS 9.3). For *AGRP*, *NPY* and *NPYR1*, there was greater ( $P < 0.05$ ) abundance in LWS than HWS, whereas for *FOXO1* and *MC4* there was greater ( $P < 0.05$ ) expression in HWS. Food withdrawal affected hypothalamic *NPY* mRNA abundance, where *NPY* mRNA was greater in fed LWS chicks as compared with fed HWS ( $P < 0.05$ ) and fasted LWS chicks ( $P < 0.05$ ). In conclusion, there was greater mRNA abundance of food intake-stimulatory factors in LWS and greater abundance of satiety-inducing factors in HWS. These results suggest that differences in food intake between LWS and HWS are associated with differences in the appetite circuitry of the hypothalamus and that these differences are accentuated under certain feeding conditions.

### Astronomy, Mathematics, and Physics

AN INEXPENSIVE RADIO TELESCOPE IN A COLLEGE PHYSICS LAB, AN UPDATE. C. Crook & T.C. Mosca III, Dept. of Chem. and Phys., & Dept. of Math, Rappahannock Community College, Warsaw VA 22572. An amateur radiotelescope on the Glens campus of Rappahannock Community College was used by first-year physics students to conduct original research on solar radio frequency emissions. Most

notably, RF signals were recorded that fit the characteristic profile of solar flare emissions that approximately coincided with a flare confirmed by NASA and other radio observatories. Slight anomalies in the time that this flare was recorded were discussed but not resolved. The project also provided a logical context for the application of physics theories that are not directly observable, such as energy transmission by magnetohydrodynamic waves through the solar plasma.

FLUCTUATIONS IN A THERMOELECTRIC AND INFRARED POWER GENERATION. H. S. Mann<sup>1</sup>, A. E. Masters<sup>2</sup> & G. X. Scarel<sup>1</sup>, <sup>1</sup>James Madison University, Dept. of Physics and Astronomy, Harrisonburg, VA 22807, & <sup>2</sup>Custom Thermoelectric, Bishopville, Maryland 21813. In recent years, the interest in alternative energies has risen greatly. Infrared radiation represents a significant portion of the solar spectrum which is worth exploiting. Capturing infrared radiation and converting it into usable electricity has been demonstrated using power generators. However there is evidence that power generators interact differently with heat or infrared radiation. This work addresses the fluctuations in voltage observed in a power generator interacting with heat in an open and isolated environment. The results are then compared with the fluctuations in voltage generated by infrared radiation on a power generator in an open and isolated environment. The findings from these measurements contribute to further understanding the distinction between infrared and thermoelectric power generation, as well as the fundamental physics of the power generators involved.

A WISE SEARCH FOR EXCESS MID-INGRARED EMISSION FROM 100,000 NEARBY M DWARFS IN THE SUPERBLINK PROPER MOTION SURVEY. C. A. O'Donnell<sup>1,2</sup>, S. Lepine<sup>2,3</sup> & B. Rojas-Ayala<sup>2</sup>, <sup>1</sup>Department of Astronomy, University of Virginia, Charlottesville VA 22904, <sup>2</sup>American Museum of Natural History, New York NY 10024, & <sup>3</sup>City University of New York, New York NY 10075. We searched the Wide-field Infrared Survey Explorer (WISE) catalog to identify mid-infrared counterparts of 100,000 M dwarfs within 100 parsecs of the Sun selected from the SUPERBLINK proper motion survey. An M dwarf with infrared excess can be a sign of dust or planetary material that is re-emitting absorbed optical light; both possibilities would presumably increase a system's overall infrared flux compared to the expected flux of the star alone. Additionally, such systems are likely to be very young. The WISE survey covered 4 bands centered at 3.4, 4.6, 12, and 22 micrometers (W1, W2, W3, and W4 respectively). Since almost all of the M dwarfs did not have reliable W4 magnitudes, we focused on the W1-W3 color and found that the vast majority of M dwarfs had  $W1-W3 < 0.5$ . After systematic examination of all stars with redder colors (i.e.,  $W1-W3 > 0.5$ ), including visual verification of the WISE images, we have identified 172 M dwarfs with clear infrared excesses ( $0.5 < W1-W3 < 2.48$ ) and 223 additional candidates with possible but weaker infrared excesses ( $0.5 < W1-W3 < 1.27$ ). All these systems, especially the 172 high-excess systems, should be high priority targets for follow-up observations, including exoplanet survey programs. Finally, we identified 5 stars with particularly high infrared excesses ( $1.0 < W1-W3 < 2.48$ ), and their spectral energy distributions were consistent with a dust model. Future observations will confirm the source of the excess emission.

THE SIGNATURE OF RADIATIVE POLARITONS: DIELECTRIC FUNCTION AND SIMULATED SPECTRA. Yosyp Schwab & Giovanna Scarel, James Madison University, Harrisonburg, VA 22807. Surface phonon polaritons have recently received a lot of attention for their role in heat transfer in nano-structured materials. However, much less attention has been given to radiative polaritons and their vital role in determining the optical properties of insulating oxides and in infrared (IR) power generation. Here it is shown through experiment and simulation that radiative polaritons radiate in the far-IR/microwave frequency region. In order to obtain the simulated results, the classic dielectric function for insulating oxides was modified. A contribution including the radiative polaritons was added, leading to an excellent agreement with the experimental spectra. This is the first time that the location of the frequency range of radiative fields has been experimentally shown, as well as the existence of the radiative fields themselves.

INSTRUCTIONAL INSTRUMENTATION LAB EXPERIMENTS AT JAMES MADISON UNIVERSITY. Joseph D. Rudmin, & Anne Henriksen, Dept. of Integrated Science and Technology, James Madison Univ., Harrisonburg, VA 22807. James Madison University college students experience a series of laboratory activities illustrating critical concerns in designing laboratory experiments, and gain experience with common representative measurement instruments. The laboratory experiences maximize clarity of illustration of concepts, within a very modest laboratory budget. The laboratory experiences build on each other. National Instruments compact DAQ hardware and LabView software are used for the most rapid data acquisition that students collect.

MATTER-ANTIMATTER ASYMMETRY AND NEW STATES OF MATTER WITH THE BELLE EXPERIMENT. Leo Piilonen, Dept. of Physics, Virginia Polytechnic Inst. and State Univ., Blacksburg VA 24061-0435. I introduce the broad topic of elementary particle physics and how it helps us to understand the nature and workings of the universe at its most fundamental level. I then illustrate this topic through the studies of the difference in behavior between matter and antimatter and the search for new states of matter as probed in the Belle experiment and its successor, Belle II, operating at the High Energy Accelerator Research Organization (KEK) in Japan.

NUMERICAL MODELING OF THE CLIMATE CHANGE IMPACT ON RARE GENOTYPES IN NATURE. Charles L. Armstrong, Iordanka N. Panayotova, & Lisa Horth, Dept. of Mathematics & Statistics & Dept. of Biological Sciences, Old Dominion Univ., Norfolk, VA 23529. This study uses computer models created using MATLAB software to analyze the effects of climate change on rare genotypes that are activated by temperature-sensitive enzymes. The primary focus of this study is the effect that these changes would have on the black-spotted mosquitofish (*Gambusia holbrooki*). We also analyze the effects that these temperature increases and resulting decreases in melanic mosquitofish inheritance will have on the overall mosquitofish population. For this study we used a model previously published by Dr. Panayotova simulates the life cycle of this fish. For this study we have created models that account for rising temperatures, yearly temperature fluctuations, the relationship between rising temperatures and melanic inheritance, and different patterns of temperature increases.

Our results indicate that increasing temperatures will be devastating for the melanic mosquitofish population, resulting in extinction within 1000 years. Despite these findings, our simulations also indicate that if the temperature stabilizes before the melanic mosquitofish becomes extinct the melanic population will also stabilize near the frequencies present at the time the temperature stabilizes. (Supported by Old Dominion University Spring 2013 Undergraduate Research Grant.)

### **Biology with Microbiology and Molecular Biology**

GENOME MUTATION MAPPER: NEXT-GEN BIOINFORMATICS APPLICATIONS FOR VIRAL PATHOGENS DETECTION ESPECIALLY HUMAN ADENOVIRUSES. Amirhossein Shamsaddini, Donald Seto, & Ancha Baranova, School of Systems Biology, College of Science, George Mason University. To date, applying high-resolution genomics and bioinformatics approaches has yielded in-depth and better views of the natural variation of Viral Pathogens. Emerging next-generation sequencing technologies have revolutionized the collection of genomic data for applications in bioforensics, biosurveillance, and for use in clinical settings. However, to make the most of these new data, new methodology needs to be developed that can accommodate large volumes of genetic data in a computationally efficient manner. We present Two Different Applications of Computational Framework to analyze Sequences for rapid species identification and Evolution Patterns Analysis. Software for our approaches is available at <http://ssb.gmu.edu/gmm>.

TRACKING BROWN ADIPOSE TISSUE IN VISCERAL FAT TISSUE OF PATIENTS WITH OBESITY. E. Dadkhah<sup>2</sup>, R. Mehta<sup>1,2</sup>, K. Doyle<sup>1,2</sup>, A. Baranova,<sup>1,2</sup> A. Birerdinc<sup>1,2</sup> & Z. Younossi<sup>1,2,3</sup>, Betty and Guy Beatty Center for Integrated Research, Inova Health System, Falls Church VA, <sup>2</sup>Center for the Study of Chronic Metabolic Diseases, School of Systems Biology, George Mason University, Fairfax, VA, & <sup>3</sup>Center for Liver Diseases, Inova Fairfax Hospital. The Prevalence of obesity is going to increase and is estimated to reach 42% of the population by 2030. Several factors are related to obesity. One of the attractive subjects of researches which is even trying to use as a therapy for obesity these days is brown adipose tissue (BAT). The imbalance between BAT and white adipose tissue (WAT) can induce obesity. BAT promotes energy burning that avoids obesity. In this study, the proportion of BAT to WAT DNA was studied in visceral adipose tissue to find out any relation between the amount of BAT and BMI. Ninety eight fresh fat tissues were collected from obese patients at Inova Fairfax Hospital after collecting consent forms. PCR was performed with 15ng of extracted DNA. As BAT differs from WAT by the large amount of mitochondria, the ratio of mitochondrial DNA to genomic DNA considered as the ratio of BAT to WAT in the fat tissue. Two Cyclin B1 primers (CCNB1a & CCNB1C) and two mitochondrial primers (M12 & M13) were selected as genomic and mitochondrial DNA indicators respectively. C(t) values were normalized using CCNBb (IPC) for genomic and M14 for mitochondrial DNA. Technique optimization efforts are ongoing.