

**PR-06**

**Science without Borders: Histology\***

Larry Johnson (Texas A&M University)

Knowledge of histology is important in the understanding of cell biological structure and function, disease states, and therapeutic treatment. Digital histologic images, online lessons (PowerPoint presentations), and YouTube videos provide a mechanism to bring high quality histology to the world with visualizations available anywhere and anytime without the need for a microscope. The objective was to make histologic information available worldwide at no cost with the intent to help educate the world. YouTube videos and PowerPoint lessons covering most of the body have been made for three groups of students (freshmen undergraduate, upper-class undergraduate and medical students; <http://www.youtube.com/vibshistology>). PowerPoint lessons covering most of the animal body has been made for veterinary students. The PowerPoint slides have hyperlinks to access the corresponding digital histologic images (<http://peer.tamu.edu/histology.asp>). Students can visualize (on computer, tablet, or phone) these digital images as if they were looking through a microscope themselves. Currently, we have an online histology class for 94 freshmen/sophomore undergraduate students using these resources. As of 9/22/2015, our YouTube channel has enjoyed 3,280 subscribers and received 234,867 views since joining YouTube 1/14/2013. Only one third of these views were from the USA. The videos have received several comments from all over the world. One medical student from South Africa commented that "she needed a histology instructor and now she has a virtual one."

Key Terms:     Histology  
                  Digital  
                  Video

\*Reprinted for a change in the title.

**PR-19**

**Looking for *Macrobiotus americanus* (Packard, 1873)\***

Emma Perry (Unity College), William R. Miller (Baker University)

In 1873, the first tardigrade was described in America by Packard. This tardigrade was collected by Rev. Cross from New Gloucester, Maine and described by Packard as *Macrobiotus americanus*. By 1938, Mathews had relegated this taxon to the status of *incertae sedis* due to insufficient information. In this same paper Mathews confused the Maine species with a similar second species also described by Packard in the same publication (1873). This second species was sent by Prof. Bessey from Ames, Iowa and Mathews (1938) listed it as *Thulinus augusti*. Here we examine the tardigrade fauna of New Gloucester, Maine and evaluate possible candidates for Packard's *Macrobiotus americanus*. Twenty six samples of moss, and lichen were collected from sites known to exist in Reverend Cross' lifetime. More than 400 tardigrades were found and the twelve species identified were compared to the sparse taxonomic information given by Packard in 1873.

\*Reprinted to add coauthor.

## PR-22

### Small Landholder Agroforestry in a Rain-fed Region Of South India

Pamela Scheffler (University of Hawaii–Hawaii Community College), Siddappa Setty (Ashoka Trust for Research in Ecology and the Environment), Timothy Scheffler (University of Hawaii –Hilo)

We surveyed 90 landowners in 13 villages in the Malai Mahadeshwara Hills Wildlife Sanctuary to better understand the role of agroforestry in traditional south Indian farms in a forest landscape matrix. The average landholding is 2.96 acres and over 96% of the land in production is rain-fed with no access to irrigation. Agriculture is diverse, a total of 29 crops under cultivation, but is dominated by the production of finger millet (*ragi*), beans (*avare*), brown mustard (*sasive*) and maize (*jola*). Small farmers play a significant role in biodiversity preservation by protecting and planting native and economically important tree species on their properties. We found a total of 1,514 trees of 137 species on the agroforestry land of these farmers. The number of trees per property ranged from 1 (7 landowners) to 142 (1 landowner) with about half (48%) of the landowners maintaining 9 or more trees on their property. Home or Kitchen Gardens also play an important role in the incorporation of trees into the landscape, accounting for approximately 10% of the abundance and 1/3 of the diversity of tree species.

Key Terms:     Agroforestry  
                  Biodiversity  
                  Agriculture

## PR-23

### Effects of cinnamon extracts on adipogenesis, differentiation and lipid droplet accumulation in 3T3-L1 cells

Amy Stockert (Ohio Northern University), Amy Aulthouse (Ohio Northern University), Ellen Freeh (Ohio Northern University), Sabrina Newstead (Ohio Northern University)

Cinnamon has been used medicinally for decreasing blood glucose values. Type 2 diabetes and obesity are growing concerns of public health and a more detailed understanding of the mechanisms involved in these disease states are vital. Correlations between type 2 diabetes and obesity support overlapping signaling mechanisms in both carbohydrate and lipid metabolism. Additionally metabolic effects on differentiation could begin to explain the difficulties individuals with obesity or type 2 diabetes suffer when attempting weight loss. We explored lipid droplet formation and quantitated lipid volume as a marker of adipogenesis using oil red O staining. Experiments were completed using 3T3-L1 pre-adipocytes in both monolayer and three-dimensional agarose culture to examine differentiation, cell size, morphology and viability. Our results suggest that treatment with cinnamon extract in both culture types promotes differentiation from fibroblast-like morphology to round adipocyte morphology. Likewise, we see significant lipid droplet formation in treated cells. Differentiation was enhanced even in the absence of differentiating media. Additionally we observed a reduction in cell size when treated with cinnamon extract at plating. In order to examine if cinnamon was increasing cAMP dependent signaling for lipase activation, and therefore altering cell size, we utilized a phosphodiesterase inhibitor to compare size and lipid droplet accumulation. Our results suggest cinnamon alters cytoskeleton protein expression and results in a contracted cell size.

Key Terms:     Cinnamon  
                  Adipogenesis  
                  Differentiation

### PR-24

#### Subphthalocyanines: A Promising Alternative for Fullerene Electron Acceptors in Organic Photovoltaics

Lakshmi Chockalingam Kasi Viswanath (Oklahoma Baptist University)

One of the greatest challenges for our modern society with burgeoning energy demand and inadequate reserve of traditional fossil fuel sources is to find clean and renewable energy sources. Modern technology has taken its stand to solve this energy challenge so as to harvest clean, renewable and abundant solar power by many attractive methods. The most important of all those techniques is the development of photovoltaic cells also called as solar cells, which directly converts solar energy to electricity. Extensive research has been done on organic photovoltaic (OPV) materials owing to their potential for offering low-cost solar energy conversion. An immense escalation in the efficiency of OPV devices to over 12% attracts commercial interests for further investigation, development and manufacturing of donor acceptor conjugates for photovoltaic cells. While porphyrins, phthalocyanines, ruthenium complexes, conjugated oligomers and polymers are the most common donor moieties; fullerenes and its derivatives are generally applied as electron acceptor counterparts. Conversely, fullerene electron acceptors have encountered several shortcomings such as weak absorption in the visible spectral region, overly high electron affinity and easy photo-oxidation that can question the lifetime of the solar cell. In the quest to find promising alternatives to fullerenes, subphthalocyanines have been identified as suitable candidates, which possess strong absorption in the visible region with high extinction coefficients. The specific aims of this study are to construct donor acceptor conjugates utilizing subphthalocyanine units as electron acceptors by direct axial nucleophilic substitution.

Key Terms:      Photovoltaics  
                         Donor Acceptor Conjugates  
                         Subphthalocyanine

### PR-25

#### Phytotoxic Effect of Oilfield Wastewater on the Physiology and Chlorophyll Content of Some Crops

Emylia Tamunodiari Jaja and Omokaro Obire (University of Science and Technology in Nigeria)

Wastewater from petroleum exploration and production activities in Kwale, Ndokwa Delta State, Nigeria was investigated to determine the impact on four important crops. The impact of wastewater mixtures of 0%, 25%, 50%, 75% and 100% on plant height and girth, leaf length, width and area, root density, chlorophyll content, crude fibre and total ash on *Zea mays* (maize), *Abelmoschus esculentus* (okra), *Arachis hypogea* (peanut) and *Telfairia occidentalis* (fluted pumpkin) was determined. We observed a reduction in root density for all the crops with increasing concentration of oilfield wastewater. The effect on chlorophyll varied among plants. Maize and peanut chlorophyll were higher in treated plants than the controls. Pumpkin and okra chlorophyll was both impaired by the wastewater. Pumpkin height and girth was impaired at all levels of wastewater while leaf length, width and area were higher at 50%. Maize height, girth, and leaf area were highest at 50% and okra also showed highest height at 50%. Peanut height, girth, leaf length, width and area were impaired at all levels of wastewater. Crude fibre was reduced for maize while total ash content increased. Crude fibre and total ash in peanut were reduced at all levels of wastewater. Although crude fibre in pumpkin was lowest in the control, its total ash was impaired by wastewater treatment. Crude fibre for okra reduced by wastewater while total ash was increased. Our studies suggest that petroleum production wastewater clearly impaired numerous growth characteristics of economically important crops essential for local food supplies.

Key Terms:      Oilfield wastewater  
                         Crops  
                         Leaf area  
                         Chlorophyll  
                         Root density  
                         Food scarcity

## STUDENT POSTER ABSTRACTS

---

### CBB-25

#### Recalcitrance of the *Burkholderia multivorans* Outer Membrane for Chemical Permeabilization to Hydrophobic Substances

Allison McDonald (Oklahoma State University Center for Health Sciences)  
Advisor: Franklin Champlin (Oklahoma State University Center for Health Sciences)

*Burkholderia multivorans* is a member of the *Burkholderia cepacia* complex (Bcc), certain species of which cause opportunistic pulmonary infections and are intrinsically resistant to many antibiotics. We have previously reported that chemical permeabilization of the outer membrane of the phylogenetically-related bacterium *Pseudomonas aeruginosa* sensitizes it to low concentrations of hydrophobic antibacterial molecules. The purpose of the present study was to determine if *B. multivorans* is susceptible to permeabilization in a manner similar to that of *P. aeruginosa*. Hydrophobic antibiograms and conventional macrobroth dilution bioassays were employed to establish baseline susceptibility levels. The ability of four different outer membrane permeabilizers to sensitize isolates of disparate origin to triclosan and the hydrophobic antibiotic novobiocin were assessed using turbidimetric measurements of batch cultural growth. The ability of the hydrophobic fluorescent probe 1-N-phenyl-naphthylamine (NPN) to partition into treated outer cell envelopes was also measured. *P. aeruginosa* and *P. multocida* were examined for comparative purposes. All *B. multivorans* strains were equally resistant to all hydrophobic antibacterial agents examined. However, they were shown to be more susceptible to novobiocin, equally resistant to triclosan, and more resistant to the outer membrane permeabilizer polymyxin B when compared with *P. aeruginosa*. Also in contrast to *P. aeruginosa*, *B. multivorans* was refractory to sensitization to hydrophobic compounds and inaccessible to NPN when treated with outer membrane permeabilizers. These data support the notion, that while both organisms exhibit intrinsic resistance to hydrophobic molecules, the outer membrane of *B. multivorans* resists permeabilization by chemical modification unlike that of *P. aeruginosa*.

Key Terms: Microbiology  
Cell envelope physiology  
Chemical permeabilization

### CBB-26

#### Effects of GSM™ (Global Systems for Mobile Communication) radiation on size of *Paramecium tetraurelia*

Samuele Weekes (SUNY Plattsburgh)  
Advisors: Nancy L. Elwess (SUNY Plattsburgh), Sandra M. Latourelle (SUNY Plattsburgh)

Would you stop using your cell phone if you knew it had the potential to harm certain cells of your body? Society's current predicament is that most individuals in this age value communication over potential unknown long term health effects. It is known that cellular devices operating on the Global Systems for Mobile communication or GSM™ network have a phenotypical effect on *Paramecium* (Cammaerts, 2011). When a text message or a phone call is made, or even when a cell phone is at rest, radiation is being emitted and taken in by the cellular device in the spectrum of microwaves in order to communicate with cell towers, mobile switching offices and ultimately the person that one is trying to reach. The most common band frequency used in North America is GSM™ or Global System for Mobile Communication, which operates at 900 MHz (Poole, 2014). Cell Phones have only been in use for about 42 years and have been utilizing GSM™ frequencies for less, therefore long term effects are still unknown (Seward, 2013). With the help of an ordinary cellular phone in the experimental setup *paramecia* were either exposed (experimental) or unexposed (control) directly to the microwaves given off by the phone. Differences in the measurement of widths were measured using ImageJ and recorded for analysis. After all the data was collected a t-test was performed for control vs experimental widths to establish whether any changes in size were statistically significant.

Key Terms: GSM™  
*Paramecium tetraurelia*  
Specific Absorption Rate or SER

## STUDENT POSTER ABSTRACTS

---

### CHM-05

#### Synthesis of a Modified Metal Organic Framework as a Gas Storage and Sensing Material

Megha Vyakaranam (University of Texas at Dallas)  
Advisor: Ronald Smaldone (University of Texas at Dallas)

Hydrogen has the highest energy per mass of any fuel and also offers zero tailpipe emissions from vehicles. However, its low ambient temperature density results in a low energy per unit volume, requiring the development of advanced storage methods that have potential for higher energy density. US DOE set targets for Hydrogen Storage Systems onboard for light duty vehicles to be met by 2020 through advanced research in Hydrogen storage technologies.

Metal Organic Frameworks (MOFs) have high surface areas for efficient gas storage where one gram of such MOF material can have a surface area of up to forty tennis courts. Although MOFs have been tested for high porosity and surface areas, MOFs with rich electron density and quenching are yet to be discovered. In this study, a process of MOF synthesis was explored to create a novel, highly quenched, sensitive, and electron dense MOF than MOF-5. The synthesizing process included a reductive amination as a chemical functionalization to create the organic ligand, 2-(dimethylamino)terephthalic acid. MOF-5, the parent structure, was also synthesized to compare the benefits of the newly synthesized MOF (DMA-MOF). Through fluorescence results, the novel MOF proved to be a better quencher in comparison to MOF-5 due to its interaction with the electron-deficient, Tetracyanoquinodimethane (TCNQ). More quenching confirmed that the DMA-MOF had a higher surface area, because more external quenching implies a higher surface area. The calculated barycentric mean fluorescence determined that the DMA-MOF also has potential applications in chemical sensing.

Key Terms:    Chemistry  
                  Materials  
                  Gas storage

### GSC-03

#### Evidence of a Possible Tsunami in Lake Sediments on San Salvador Island, The Bahamas

Jennica Grady (University of Missouri-Kansas City)  
Advisor: Tina Niemi (University of Missouri-Kansas City)

French Pond is one of many brackish to hypersaline, interdunal lakes located on San Salvador Island. The lake is on the southwest side of the island and in March 2014, three soft sediment cores were removed along a transect near the southern shoreline of the lake. Depositional units within the core were determined by describing composition, color, geochemical analysis, and grain size. Three separate layers within the core were characterized as being predominately of a marine influence. The youngest unit shows a distinctive erosional boundary with the underlying peat, suggesting that the above sand was deposited rapidly, exhibiting characteristics of a catastrophic event. This section also displays a fining upward grain size sequence, and through x-ray fluorescence (XRF), denotes a particular geochemical pattern. By comparison, the other units of interest show a uniform grain size and contrasting geochemical characteristics. In addition, radiocarbon dating was employed to calculate the age of the underlying peat layer and the overlying algal mat unit in order to support the results of an earlier study on a lake on the northwest side of the island, providing evidence that suggests that a related event may have impacted both lakes within the same timeframe. To further substantiate evidence of a tsunami deposit, microfossils were extracted, quantified, and identified to determine if there is relationship between depositional event and diversity of microfossil assemblage.

Key Terms:    Tsunami  
                  Microfossils  
                  Limnology

## STUDENT POSTER ABSTRACTS

---

### MCS-05

#### The Design and Analysis of a Quaternary Data Storage System

Thorsen Wehr (Odessa High School)

Advisor: Jeffery Wehr (Odessa High School)

Utilizing large amounts of data is important for most modern activity, and its efficient storage is crucial for practicality. Magnetic hard drives used parallel magnetic fields to store data until perpendicular storage was found advantageous. The engineering goal of this experiment was to design a quaternary data storage system simultaneously utilizing parallel and perpendicular magnetic fields with means of testing practicality. The hypothesis was that if magnetic fields were arranged simultaneously parallel and perpendicular to a plane, the difference in direction would be detectable and for quaternary based storage. An imitation computer hard drive was constructed from neodymium magnet cubes with magnetic fields arranged in reference to the surface. They were set perpendicular and parallel to the disk and set to hold a simple string of quaternary code. The reading head consisted of a copper wire with each end connected to a Vernier voltage probe to detect changes in magnetic field utilizing the Faraday Effect. This research was considered a success, the engineering goal of creating a system capable of testing quaternary data storage was achieved and the hypothesis was accepted, as the waveforms for parallel and perpendicular are noticeably different and could be used for a storage system.

Key Terms:     Data storage  
                  Hard Drive  
                  Quaternary

### PHA-04

#### A Feasibility Study for the Photo-production of an All-Charm Tetraquark State in Ultra-peripheral Lead Ion Collisions

Jordan Daniel Roth (Creighton University)

Advisor: Michael Cherney (Creighton University)

The feasibility for detecting an all-charm tetraquark in ultra-peripheral Pb-Pb collisions is evaluated through simulations. In particular this study will examine the acceptance and efficiency of the ALICE experiment at the Large Hadron Collider for the decay of this bound state into two  $J/\psi$  mesons. The primary background is estimated with the Starlight Monte Carlo production model and the ALICE Reconstruction Framework. A background of 2.1 events is expected for the  $1 \text{ nb}^{-1}$  data sample that is expected for Run 2.

Key Terms:     High-energy physics  
                  Particle physics  
                  Tetraquark

## STUDENT POSTER ABSTRACT, INDEX OF PRESENTERS AND CANCELLATIONS

---

### PHA-05

#### A Compact Atomic Source And Radio-Frequency Circuit For Ultra-Cold Atoms

Alex Tarter (Creighton University)

Advisor: Jonathan Wrubel (Creighton University)

Experiments involving Bose-Einstein condensates (BEC's), which are ultra-cold atoms in the nanokelvin range, provide opportunities for physicists to manipulate and study quantum systems at large scales. Major areas of concern in the creation of BEC's are keeping the system in vacuum to isolate the atoms and creating a magneto-optical trap (MOT) that serves as one of the initial cooling stages of the experiment. We report on the progress toward a BEC of  $^{41}\text{K}$  at Creighton University. We describe the development of a heated atomic source and a radio-frequency resonance circuit that will be used to control the magnetic interactions between atoms in the system.

Key Terms:      Bose-Einstein condensate  
                     Laser cooling  
                     Resonance circuit

Presenter	Poster Number
Grady, Jennica	GSC-03
Guillot, Melisa	GSC-02, see program book
Johnson, Larry	PR-06
McDonald, Allison	CBB-25
Obire, Omokaro	PR-25
Perry, Emma	PR-19
Roth, Jordan Daniel	PHA-04
Scheffler, Pamela	PR-22
Schneider, Sidney	CBB-05, see program book
Stockert, Amy	PR-23
Tarter, Alex	PHA-05
Viswanath, Lakshmi Chockalingam Kasi	PR-24
Vyakaranam, Megha	CHM-05
Weekes, Samuele	CBB-26
Wehr, Thorsen	MCS-05

Sigma Xi Chapter	Poster Number
University of Kansas	CHP-01
University of Missouri-Kansas City	CHP-02
Georgia Institute of Technology	CHP-03
Kansas State University	CHP-04
Oklahoma State University	CHP-05
University of Texas at Dallas	CHP-06
State University of New York at Fredonia	CHP-07
Clemson University	CHP-08
South Dakota School of Mines and Technology	CHP-09
University of Toledo	CHP-10
Western Carolina University	CHP-11

The following people cancelled their presentations for the Student Research Conference:

Gutierrez Fugon, Orangel	PSI-03
Lindenmayer, Kevin	ENG-03
Pouriran, Ramin	CBB-03