

Western Collegiate Division Meeting of the Tennessee  
Academy of Sciences

Hosted By:

Christian Brothers University

Memphis, Tennessee



Saturday, April 5, 2014

**Schedule of Events**  
**Tennessee Academy of Science**  
**April 5, 2014**  
**Christian Brothers University**

Registration (Assisi Hall Foyer)	8:30
Welcome and Introduction	8:55
Introduction of Keynote Speaker	9:00
Keynote Address	AH 153

**Dr. Diana Outlaw, Assistant Professor, The Mississippi State University, Starkville,  
Mississippi**  
**“Evolution and Diversification in Malaria Parasites”**

Sessions 1- 3 Oral Presentations		9:45
Session 4 Poster Presentations	Assisi Foyer	12:30 – 1:00
Lunch	Sabbatini Lounge Thomas Center	1:00 – 2:00

Closing:

Announcement of Best Paper Awards

Business Meeting

**Session One: Organismal Biology AH 155**

**Judges:** Dr. Cheryl Goudie – The University of Memphis  
Dr. Steve Reichling – Memphis Zoo

9:45 – 12:15

Moderator: Dr. James Moore

**Session Two: Health and Medical Sciences AH 153**

**Judges:** Dr. Harmon Dunathan – Christian Brothers University  
Dr. T.Yee Wong – The University of Memphis

9:45 – 12:15

Moderator: Dr. Malinda Fitzgerald

**Session Three: Engineering AH 151**

**Judges:** Dr. John Varriano – Christian Brothers University  
Dr. Ted Clarke – Christian Brothers University

9:45 – 11:00

Moderator: Dr. John Varriano

**Session Four, Poster Presentations: Assisi Hall Foyer**

**Judges:** Dr. Martha Brown – The University of Memphis  
Dr. Michael Schiebout – Union University

12:30 – 1:00

Time	Organismal Biology – AH 155	Health & Medical Sci – AH 153	Engineering – AH 151
9:45	Differences in trace metal accumulation in lichens between Overton Park and the road side. <b>Corey Keyser*</b> , <b>Lynda R. Miller</b> , and <b>Thomas J. Sullivan</b> , <i>Collierville High School (CK), Christian Brothers University (LM, TS)</i>	Preclinical assessment of gemcitabine as an effective new treatment of Ependymoma. <b>Hope Gilbertson*</b> <b>Nidal Boulos</b> , <b>Jason Dapper</b> , and <b>Richard Gilbertson</b> , <i>Christian Brothers University</i>	The production of a quadcopter. <b>John Vo*</b> ; <i>Christian Brothers University</i>
10:00	Effects of <i>Ailanthus altissima</i> allelopath on the nodulation and growth of <i>Coronilla varia</i> . <b>Catherine Thorn*</b> , <b>James E. Moore</b> , <i>Christian Brothers University</i>	SD-OCT scanning of the optic nerve in diagnosis of glaucoma. <b>Cale Baskin*</b> and <b>Eric Sigler</b> , <i>Christian Brothers University</i>	Escape from the minefield. <b>Shilpa Appurubugatha*</b> , <b>Sean Dantis*</b> and <b>Matthew Winters*</b> , <i>Christian Brothers University</i> ,
10:15	Comparison of lichen populations in urban and rural sites. <b>Tekira Mills*</b> , <b>Lynda Miller</b> , and <b>Thomas Sullivan</b> ; <i>Memphis School of Excellence (TM), Christian Brothers University (LM, TS)</i>	Sleep deprivation and anxiety exhibited in mice. <b>Eric M. Joe*</b> , <b>Scott Lattimer</b> and <b>Kristin M. Hamre</b> . <i>Christian Brothers University</i>	IEEE SoutheastCon 2014 hardware competition. <b>Jerry W. Counce*</b> , <b>Cody R. Crow*</b> , <b>Michael B. Powers*</b> , <i>Christian Brothers University</i>
10:30	Avian malaria in East Tennessee. <b>Alison Hanson*</b> , <b>Alix Matthews*</b> , <b>Vincenzo Ellis*</b> , <b>Jackson Roberts*</b> , and <b>Michael Collins</b> , <i>Rhodes College</i>	Fibrosarcoma cells expressing CD9 increase matrix metalloproteinase 9 production – a process regulated by epidermal growth factor receptor. <b>Jessica F. Jameson*</b> , <b>Michael J. Herr</b> , <b>Scott E. Mabry</b> , <b>Lisa K. Jennings</b> . <i>Christian Brothers University</i> ,	Challenge Center’s Activity: “Lost in the Jungle.” <b>Mitchell Clayton Moorehead*</b> and <b>Charmaine Cooper*</b> , <i>Christian Brothers University</i>
10:45	<b>BREAK</b>	<b>BREAK</b>	<b>BREAK</b>
11:00	Heavy metal uptake by lichens in an urban environment. <b>Sarah Fay*</b> , <b>Thomas Sullivan</b> , and <b>Lynda Miller</b> <i>Collierville High School (SF), Christian Brothers University (LM, TS)</i>	Diet, not body weight, electrically remodels hypothalamic circuits controlling appetite. <b>Kevin Pham*</b> , <b>Alana Smith</b> , and <b>Kristen O’Connell</b> . <i>Christian Brothers University</i>	The Smart Cube Solver. <b>Adam Tekle*</b> and <b>Viet Minh Tong*</b> , <i>Christian Brothers University</i>
11:15	Measuring the stress levels of French grunts ( <i>Haemulon flavolineatum</i> ) from hatchery-rearing to the marketplace. <b>Sarah Porter*</b> and <b>James R. Kerfoot</b> , <i>Union University</i>	A comparison of letter vs. continuous text contrast sensitivity testing. <b>Kristen Davis*</b> , <b>Marc B. Taub</b> , <i>Christian Brothers University</i>	
11:30	Investigating the escape response to auditory and visual stimuli in American crows. <b>Chelsea N. Cothran*</b> , <b>James Kerfoot</b> , and <b>James Huggins</b> , <i>Union University</i>	High throughput screening for protection of hair cell within the Organ of Corti against Cisplatin Ototoxicity. <b>Russell Higgins*</b> , <b>Tal Teitz</b> , and <b>Jian Zuo</b> . <i>Christian Brothers University</i>	
11:45	Detection and occurrence of <i>Batrachochytrium dendrobatidis</i> in amphibian populations of eastern Arkansas and western Tennessee. <b>D. Smith*</b> , <b>J. E. Moore</b> , <b>S. M. Hanlon</b> , <b>J. L. Kerby</b> , <b>M. J. Parris</b> , <b>W. Peterson</b> , and <b>E. Berg</b> . <i>Christian Brothers University</i>	How demographic factors influence the cortisol levels of infants and young children. <b>Stephanie Allen-Winters</b> . <i>Christian Brothers University</i>	
12:00	The nature, occurrence, and function of 2-methoxy-1,4-naphthoquinone in <i>Impatiens capensis</i> . <b>Eron R. Raines*</b> , <i>University of Memphis</i>	Analysis of expression patterns of tuberin and hamartin in mice with high fat diets. <b>Elton Banks*</b> , <b>Deborah Azzi-Nogueira</b> , <b>A.C Rodrigues</b> , <b>A.S Torrão</b> , <b>L.A Haddad</b> and <b>L.R.G Britto</b> , <i>Christian Brothers University</i>	
12:15	Eau de Tigres: Effects of specialized scent enrichment on tiger behavior and physiology and visitor perception. <b>Stephen Leavelle*</b> , <b>Corinne Pisacane</b> , and <b>Lance Miller</b> , <i>Rhodes College</i>	SepG in <i>Aspergillus nidulans</i> encodes an IQGAP protein. <b>Kristen E. Wendt*</b> and <b>Terry W. Hill</b> . <i>Rhodes College</i>	

**Diana Outlaw, Ph.D.**  
**Assistant Professor**  
**Mississippi State University**



**Keynote Speaker**

**“Evolution and Diversification in Malaria Parasites”**

B.A. in Biology, Sonoma State University (California)

M.A. in Biology, Sonoma State University (California)

Ph.D. in Biology, University of Memphis

Postdoctoral Research Associate, University of Missouri, St. Louis

## Session One: Organismal Biology

Moderator: James Moore

9:45. Differences in trace metal accumulation in lichens between Overton Park and the road side. **Corey Keyser\***, **Lynda R. Miller**, and **Thomas J. Sullivan**, *Collierville High School, Memphis, Tennessee (CK) and Christian Brothers University, Memphis, Tennessee (LM, TS)*.

10:00. Effects of *Ailanthus altissima* allelopath on the nodulation and growth of *Coronilla varia*. **Catherine Thorn\***, **James E. Moore**, *Christian Brothers University, Memphis, Tennessee (CT, JEM)*.

10:15. Comparison of lichen populations in urban and rural sites. **Tekira Mills\***, **Lynda Miller**, and **Thomas Sullivan**; *Memphis School of Excellence, Memphis, Tennessee (TM), Department of Biology, Christian Brothers University, Memphis, Tennessee (LM, TS)*.

10:30. Avian malaria in East Tennessee. **Alison Hanson\***, **Alix Matthews**, **Vincenzo Ellis**, **Jackson Roberts**, and **Michael Collins**, *Rhodes College, Memphis, Tennessee (AH, AM, JR, and MC), and University of Missouri- St. Louis, St. Louis, Missouri (VE)*.

### 10:45. BREAK

11:00. Heavy metal uptake by lichens in an urban environment. **Sarah Fay\***, **Thomas Sullivan**, and **Lynda Miller** *Collierville High School, Collierville, TN (SF), Department of Biology, Christian Brothers University, Memphis, TN (TS, LM)*.

11:15. Measuring the stress levels of French grunts (*Haemulon flavolineatum*) from hatchery-rearing to the marketplace. **Sarah Porter\*** and **James R. Kerfoot**, *Union University, Jackson, Tennessee (SP and JK)*.

11:30. Investigating the escape response to auditory and visual stimuli in American crows. **Chelsea N. Cothran\***, **James Kerfoot**, and **James Huggins**, *Union University Jackson, Tennessee (CC, JK, and JH)*.

11:45. Detection and occurrence of *Batrachochytrium dendrobatidis* in amphibian populations of eastern Arkansas and western Tennessee. **D. Smith\***, **J. E. Moore**, **S. M. Hanlon**, **J. L. Kerby**, **M. J. Parris**, **W. Peterson**, and **E. Berg**, *Department of Biology, Christian Brothers University (DS, JM), and Department of Biological Sciences, The University of Memphis, Memphis, Tennessee (SH, MJP), and Department of Biology, University of South Dakota, Vermillion, South Dakota (JK, EB), and Wapanocca National Wildlife Refuge, US Fish and Wildlife Service, Turrell, Arkansas (WP)*.

12:00. The nature, occurrence, and function of 2-methoxy-1,4-naphthoquinone in *Impatiens capensis*. **Eron R. Raines\***, *University of Memphis, Memphis, Tennessee*.

12:15. Eau de Tigres: Effects of specialized scent enrichment on tiger behavior and physiology and visitor perception. **Stephen Leavelle\***, **Corinne Pisacane**, and **Lance Miller**, *Rhodes College, Memphis, Tennessee (SL)*, and *San Diego Zoo Global, San Diego, California (CP, LM)*.

## Session Two: Health and Medical Sciences

Moderator: Dr. Malinda Fitzgerald

9:45. Preclinical assessment of gemcitabine as an effective new treatment of Ependymoma. **Hope Gilbertson\*** **Nidal Boulos**, **Jason Dapper**, and **Richard Gilbertson**, *Christian Brothers University, Memphis, Tennessee (HG)* and *St. Jude Children's Research Hospital, Memphis, Tennessee (NB, JD, and RG)*.

10:00. SD-OCT scanning of the optic nerve in diagnosis of glaucoma. **Cale Baskin\*** and **Eric Sigler**, *Christian Brothers University, Memphis, Tennessee (CB)*, and *Charles Retina Institute, Memphis, Tennessee (ES)*.

10:15. Sleep deprivation and anxiety exhibited in mice. **Eric M. Joe\***, **Scott Lattimer** and **Kristin M. Hamre**. *Christian Brothers University, Memphis, Tennessee (EMJ)*, and *University of Tennessee Health Science Center, Memphis Tennessee (SL and KMH)*.

10:30. Fibrosarcoma cells expressing CD9 increase matrix metalloproteinase 9 production – a process regulated by epidermal growth factor receptor. **Jessica F. Jameson\***, **Michael J. Herr**, **Scott E. Mabry**, **Lisa K. Jennings**. *Christian Brothers University, Memphis, Tennessee (JFJ)*, *The University of Tennessee, Memphis, Tennessee (MJH, SEM, and LKJ)*.

### 10:45. BREAK

11:00. Diet, not body weight, electrically remodels hypothalamic circuits controlling appetite. **Kevin Pham\***, **Alana Smith**, and **Kristen O'Connell**. *Christian Brothers University, Memphis, Tennessee (KP)*, *University of Tennessee Health Science Center, Memphis, Tennessee (AS, and KO)*.

11:15. A comparison of letter vs. continuous text contrast sensitivity testing. **Kristen Davis\***, **Marc B. Taub**, *Christian Brothers University, Memphis, Tennessee (KD)* *Southern College of Optometry, Memphis, Tennessee (MBT)*.

11:30. High throughput screening for protection of hair cell within the Organ of Corti against Cisplatin Ototoxicity. **Russell Higgins\***, **Tal Teitz**, and **Jian Zuo**. *Christian Brothers University, Memphis, Tennessee (RH)* and *St. Jude Children's Research Hospital, Memphis, Tennessee (TT and JZ)*.

11:45. How demographic factors influence the cortisol levels of infants and young children. **Stephanie Allen-Winters\*** and **Kanjaleet Anand**. *Christian Brothers University, Memphis, Tennessee (SAW)*, and *The University of Tennessee Health and Science Center, Memphis, Tennessee (KA)*.

12:00. Analysis of expression patterns of tuberin and hamartin in mice with high fat diets. **Elton Banks\***, **Deborah Azzi-Nogueira**, **A.C Rodrigues**, **A.S Torrão**, **L.A Haddad** and **L.R.G Britto**, *Christian Brothers University, Memphis, Tennessee (EB)*, *The University of São Paulo, São Paulo, Brazil (DA, AR, AT, LH, LB)*.

12:15. SepG in *Aspergillus nidulans* encodes an IQGAP protein. **Kristen E. Wendt\*** and **Terry W. Hill**. *Rhodes College, Memphis, Tennessee (KW and TH)*.

### Session Three: Engineering

Moderator: Dr. John Varriano

9:45. The production of a quadcopter. **John Vo\***; *Christian Brothers University, Memphis, Tennessee (JV)*.

10:00. Escape from the minefield. **Shilpa Appurubugatha\***, **Sean Dantis\*** and **Matthew Winters\***, *Christian Brothers University, Memphis, Tennessee (SA, SD, and MW)*.

10:15. IEEE SoutheastCon 2014 hardware competition. **Jerry W. Counce\***, **Cody R. Crow\***, **Michael B. Powers\***, *Christian Brothers University, Memphis, Tennessee (JC, CC, MP)*.

10:30. Challenge Center's Activity: "Lost in the Jungle." **Mitchell Clayton Moorehead\*** and **Charmaine Cooper\***, *Christian Brothers University, Memphis, Tennessee (MM and CC)*.

### 10:45. BREAK

The Smart Cube Solver. **Adam Tekle\*** and **Viet Minh Tong\***, *Christian Brothers University, Memphis, Tennessee (AT and VT)*.

Session Four: Posters

1. Morphological characterization of hemoparasites from small mammals living in forest fragments in Paraguay. **Aubrey G. A. Howard\***, **Monali Lipman\***, **Alisha Patel\***, **Pastor Pérez-Estigarribia**, **Noé de la Sancha**, **Sarah Boyle**, **Laura E. Luque**, Rhodes College, Memphis, Tennessee (AH, ML, AP, SB, LL), Universidad de Concepción, Chile (PP), Chicago State University, Chicago, Illinois (NS).
2. The effect of opportunistic potential-stressor on urinary cortisol levels of a female Sumatran tiger. **Jennifer J. Marshall\***, **Erin Loeding**, and **Beth Roberts**, Rhodes College, Memphis, Tennessee (JM), and Research and Conservation Department at the *Memphis Zoological Society*, Memphis Tennessee (EL, BR).
3. Visual mechanisms in copepod mating behavior: the effect of light on mating frequencies in *Labidocera aestiva*. **Margaret R. Blake\*** and **Jonathan C. Cohen**, Rhodes College, Memphis, Tennessee (MB), and College of Earth, Ocean and Environment, University of Delaware, Lewes, Delaware (JC).
4. The influence of kinship on the presence of aggressive behaviors between Nile hippopotamuses (*Hippopotamus amphibius*) in captivity. **Sunanda Mattancheril\***, **Roberta Moore\*** and **Sarah Boyle**, Rhodes College, Memphis, Tennessee (SM, RM, and SB).
5. Arboreal mapping of the Memphis Zoo, **Mary E. DuBose\***, **Taylor Sieben\***, **John F. Menz\***, **Roberta Moore\***, **Rachel S. Jabaily**, **Connie Shepherd**, and **Sarah A. Boyle**, Rhodes College, Memphis, Tennessee (MED, TS, JFM, RM, RSJ, SAB) and the Memphis Zoo (CS).
6. Visual acuity and genetic classification of subjects with either Type I or Type II Oculocutaneous Albinism. **John D. Wolfe\***, **Ronaldo Y. Sano**, **Einat Hauzman**, **Daniela M.O. Bonci**, **Malinda Fitzgerald**, **Dora F. Ventura**, Departamento de Psicologia Experimental, Instituto de Psicologia, Universidade de São Paulo, São Paulo, Brazil (JW, EH, DB, DF, RS), Departamento de Oftalmologia da Santa Casa de Misericórdia de São Paulo, São Paulo, Brazil (RS), Department of Biology, Minority Health and Health Disparities International Research Training Program, Christian Brothers University, Memphis, Tennessee (JW, MF), Instituto Israelita de Ensino e Pesquisa, Hospital Israelita Albert Einstein, São Paulo, São Paulo, Brazil (EH, MB, DF).
7. Continuous time quantum random walks. **Rebekah Herrman\*** and **Travis Humble**, Christian Brothers University, Memphis, TN (RH) and Oak Ridge National Laboratory, Oak Ridge, TN (TH).
8. Burrowing habits and morphology of salamanders in genus *Ambystoma*. **Megan Mosier\***, **Marie Ryall\***, **Lynda Miller**, Christian Brothers University Memphis, Tennessee (MM, MR, and LM).

# ABSTRACTS

Organismal  
Session One  
Moderator: Dr. James Moore

9:45. Differences in trace metal accumulation in lichens between Overton Park and the road side. **Corey Keyser\***, **Lynda R. Miller**, and **Thomas J. Sullivan**, *Collierville High School, Memphis, Tennessee (CK) and Christian Brothers University, Memphis, Tennessee (LM, TS)*.

Lichens are unique, symbiotic organisms between algae and fungi that absorb heavy metals and other pollutants in their inner fungal layer, called the medulla. In this study, we collected approximately 300 lichen samples in the Memphis area. The sample sites are spread across road side areas on the median and shoulder, as well as within Overton Park. We then used scanning electron microscopy to analyze the lichens for the presence of trace metals absorbed by the medulla. We found that lichens collected by the road had a higher variety of accumulated pollutants than the lichens collected in Overton park. The increased exposure to car exhaust experienced on the roadside accounted for an increased variety of pollutants found in the lichens. The isolation provided by the trees and the increased distance from automobile pollutants accounted for a reduction in accumulated pollutant variety. Supported by the CBU environmental research internship.

10:00. Effects of *Ailanthus altissima* allelopath on the nodulation and growth of *Coronilla varia*. **Catherine Thorn\***, **James E. Moore**, *Christian Brothers University, Memphis, Tennessee (CT, JEM)*.

*Ailanthus altissima* is an invasive tree that is often associated with poor soil nutrients and high growth rates. *Coronilla varia*, a nitrogen fixer and an invasive herb, is usually found co-existing with *Ailanthus*. A fully factorial greenhouse experiment study was conducted to determine whether allelopathic compounds from *Ailanthus* promote the nodulation of *Coronilla* via direct root-to-root contact and watering with *Ailanthus* extract. Twenty pots of *Ailanthus*, *Coronilla*, and combinations of the two were planted for a total of sixty pots. Half were watered with H<sub>2</sub>O and the other half with *Ailanthus* exudate. Two of the sixty *Coronilla* produced nodules grown in combination with *Ailanthus* and *Ailanthus* exudate watering. Results show an increase in total biomass when the plants are grown together versus by themselves. When *Ailanthus* and *Coronilla* have direct root-to-root contact and are watered with *Ailanthus* extract there is a significant growth difference which could indicate potential allelopathic effects.

10:15. Comparison of lichen populations in urban and rural Sites. **Tekira Mills\***, **Lynda Miller, and Thomas Sullivan**; *Memphis School of Excellence, Memphis, Tennessee (TM), Department of Biology, Christian Brothers University, Memphis, Tennessee (LM, TS)*

Lichens are symbiotic organisms composed of algae and fungi, which grow on a variety of substrates, including tree trunks and canopy branches. The thallus, which is the body of the lichen, does not possess a cuticle, and therefore uptake of pollutants is common. We studied the lichens of Overton Park, Memphis, TN, an urban park that is exposed to automobile emissions to determine if the pollution will affect the number and type of species found there in comparison with a rural site that is not exposed to the direct effects of pollution generated by automobiles. As a result, community composition of the urban old growth forest is predominated by pollution tolerant species as compared to a rural forest lichen community which has a mixture of pollution tolerant and pollution sensitive species. Supported by a REAP grant from the Office of Army Research and administered by the Association of Applied Science.

10:30. Avian malaria in East Tennessee. **Alison Hanson\***, **Alix Matthews, Vincenzo Ellis, Jackson Roberts, and Michael Collins**, *Rhodes College, Memphis, Tennessee (AH, AM, JR, and MC), and University of Missouri- St. Louis, St. Louis, Missouri (VE)*.

Parasites can directly and indirectly influence the dynamics of ecological communities through their effects on host behavior, host fitness, and trophic interactions. Avian malaria is caused by haemoparasites transmitted by dipteran insect vectors. We took blood samples from 329 individuals of 42 species in eastern Tennessee in May 2013. We extracted DNA and used PCR to amplify a section of the parasite mitochondrial cytochrome *b* gene to detect and sequence positive infections. We found 144 individuals from 25 species infected with 27 distinct lineages of avian malaria. Generalized linear models show that across species, total malaria infection prevalence varies with sexual dimorphism, abundance, and nest type. Prevalence patterns for *Plasmodium* differ from those for *Haemoproteus*. We conclude that malaria prevalence is influenced by the ecological traits of its avian hosts. Interaction webs demonstrate that this system is complex with varying host specificity, prevalence, and richness of their haemosporidian parasites.

#### **10:45. BREAK**

11:00. Heavy metal uptake by lichens in an urban environment. **Sarah Fay\***, **Thomas Sullivan, and Lynda Miller** *Collierville High School, Collierville, TN (SF), Department of Biology, Christian Brothers University, Memphis, TN (TS, LM)*.

Lichens are organisms capable of absorbing pollutants, including trace metals. These metals can be found on the surface or in the medulla of the lichen thallus. Our hypothesis was that lichen species with morphological structures such as cracks, pores, soredia and isidia will allow the metals access to the internal fungal layer of the lichen and thus increasing its chance of accumulation. Scanning electron microscopy with energy dispersive x-ray spectroscopy was used to determine the presence, absence, and specific metal found in the lichen. Our preliminary data has shown some variation of metal accumulation with respect to lichen structures that are present on the surface of the lichen species. Supported by a REAP grant from the Office of Army Research and administered by the Association of Applied Science.

11:15. Measuring the stress levels of French grunts (*Haemulon flavolineatum*) from hatchery-rearing to the marketplace. **Sarah Porter\*** and **James R. Kerfoot**, Union University, Jackson, Tennessee (SP and JK).

In the aquaculture industry, stress is a leading cause of disease and death in fish during transport to market. Cortisol, a stress hormone, can be used as an indicator of stress. Factors that may influence stress during transport are variable salinity, reduced oxygen, and temperature fluctuation. This study examined a noninvasive way to measure cortisol stress levels in French grunts. To test the hypothesis that cortisol levels and environmental parameters do not change during transport, water samples were collected before, upon arrival, and 24-hours after arrival from 60 samples. Cortisol levels and environmental parameters were measured in each sample and compared across time. Results indicated that there was a significant drop in cortisol levels and significant changes in dissolved oxygen, temperature and salinity over time. These results indicate that cortisol changed during transport, and regulating the environmental factors during shipping may be necessary to maintain the health of fish.

11:30. Investigating the escape response to auditory and visual stimuli in American crows. **Chelsea N. Cothran\***, **James Kerfoot**, and **James Huggins**, Union University Jackson, Tennessee (CC, JK, and JH).

Crows are known to have well-developed senses of vision and hearing and are vigilant within their environments. We hypothesized the escape velocity of a bird reacting to an auditory stimulus would not be different than that of one reacting to a visual stimulus. The escape responses of birds to auditory or visual stimuli were recorded with a Casio Exilim-Ex-F1 high-speed camera at 600fps. Escape velocities were measured from the videos and used in analyses. Results indicated the mean escape velocity of an American crow startled by an auditory stimulus was  $182.70 \pm 36.22 \text{ cm s}^{-1}$ . The mean escape velocity of an American crow startled by a visual stimulus was  $210.28 \pm 36.22 \text{ cm s}^{-1}$ . However, a two-tailed t-test indicated no significant difference between the escape velocities in response to the two stimuli; *Corvus brachyrhynchos* respond equally in escape response for auditory and visual stimuli.

11:45. Detection and occurrence of *Batrachochytrium dendrobatidis* in amphibian populations of eastern Arkansas and western Tennessee. **D. Smith\***, **J. E. Moore**, **S. M. Hanlon**, **J. L. Kerby**, **M. J. Parris**, **W. Peterson**, and **E. Berg**, Department of Biology, Christian Brothers University (DS, JM), and Department of Biological Sciences, The University of Memphis, Memphis, Tennessee (SH, MJP), and Department of Biology, University of South Dakota, Vermillion, South Dakota (JK, EB), and Wapanocca National Wildlife Refuge, US Fish and Wildlife Service, Turrell, Arkansas (WP).

*Batrachochytrium dendrobatidis* (Bd) is a chytrid fungus that interferes with the exchange of water and ions through the skin and is responsible for the rapid decline in amphibian populations worldwide. Edward J. Meeman Biological Field Station (MBFS) and Wapanocca National Wildlife Refuge (WNWR) were surveyed to determine the prevalence of Bd via qPCR analysis. At MBFS, 52 amphibians of 6 different species were captured and swabbed, while at WNWR, 46 individuals from *Acris crepitans* were sampled and swabbed. At MBFS, 19 of the 52 individuals were positive for Bd with an infection rate of 37% and the zoospore load ranged from 28 to >50,000. In WNWR, 42 of the 46 *Acris crepitans* tested positive for Bd with a zoospore load

ranging from 2 to >200,000 with a prevalence of 87%. Both areas sampled confirmed the presence of Bd within the amphibian population via qPCR analysis.

12:00. The nature, occurrence, and function of 2-methoxy-1,4-naphthoquinone in *Impatiens capensis*. **Eron R. Raines\***, *University of Memphis, Memphis, Tennessee (ER)*.

The terrestrial ecosystem is dominated largely by plant and microbial life. In the natural habitat, and in an ecologically meaningful timespan, positive and negative associations develop between plant and microbe that either increase fitness in both organisms or result in extinction. The purpose of this study has been to investigate the properties affecting and effected by the anti-fungal compound 2-methoxy-1,4-naphthoquinone (MNQ) in *Impatiens capensis*. Plant growth patterns of greenhouse-grown plants were compared to their MNQ concentrations. Plants were also sampled in natural habitats along with soils. Abiotic and biotic soil factors were determined and compared to respective MNQ concentrations. Plant growth and MNQ measurements yielded some trending. Trends were observed between soil factors and MNQ. Of special interest was positive trending of MNQ with microbial biomass considering MNQ's antifungal properties. This quick investigation has served to shed light on possible venues for more thorough and statistically rigorous analysis.

12:15. Eau de Tigres: Effects of specialized scent enrichment on tiger behavior and physiology and visitor perception. **Stephen Leavelle\***, **Corinne Pisacane**, and **Lance Miller**, *Rhodes College, Memphis, Tennessee (SL)*, and *San Diego Zoo Global, San Diego, California (CP and LM)*.

The welfare of carnivores in zoos can be enhanced through environmental enrichment. This study monitored the effects of a new scent enrichment on Sumatran tigers at the San Diego Zoo Safari Park. Behavioral data were collected for three weeks without the scent enrichment and for three weeks with the scent applied to the enclosure at randomized locations. Tiger fecal samples were collected for glucocorticoid analysis. Zoo visitors were surveyed about behaviors they observed and their responses to those behaviors. Between the control and experimental periods, there were significant increases in tiger behavioral diversity, exploratory behaviors, and exhibit area usage. The difference in glucocorticoid concentrations between conditions was not significant, nor did the behavioral diversity reported by zoo visitors change. Further experimentation is required to demonstrate whether this scent enrichment has similar effects over longer periods of time and whether it is effective when applied to tiger enclosures at other facilities.

Health and Medical Science  
Session Two  
Moderator: Dr. Malinda Fitzgerald

9:45. Preclinical assessment of Gemcitabine as an effective new treatment of Ependymoma. **Hope Gilbertson\* Nidal Boulos, Jason Dapper, and Richard Gilbertson**, *Christian Brothers University, Memphis, Tennessee (HG) and St. Jude Children's Research Hospital, Memphis, Tennessee (NB, JD, and RG)*.

Ependymomas are the third most common brain tumor in children and the most common spinal tumor in adults. The purpose of the current study was to find new treatment of this devastating disease. Previous studies from our lab have shown that gemcitabine is highly effective at inhibiting the growth of ependymoma cells *in vitro* but the mechanism of response is unknown. Therefore, we looked to see if gemcitabine might induce apoptosis of ependymoma cells both *in vivo* and *in vitro*. We show that concentrations of less than 125nM decrease in ependymoma cell viability *in vitro* by inducing cellular apoptosis. Further, ependymomas in animal models also exhibited apoptosis when treated with 62mg/kg of gemcitabine. These results support the notion that gemcitabine is an effective treatment of ependymoma and warrant further investigation in clinical trials. Supported by RO1 gran from the NCI and CERN foundation.

10:00. SD-OCT scanning of the optic nerve in diagnosis of glaucoma. **Cale Baskin\* and Eric Sigler**, *Christian Brothers University, Memphis, Tennessee (CB), and Charles Retina Institute, Memphis, Tennessee (ES)*.

Spectral domain optical coherence tomography (SD-OCT) is a type of imaging technology that produces high quality images of ocular tissues, and is commonly used in the diagnosis and treatment of ocular diseases. This study aimed to use SD-OCT to further investigate a new parameter for the characterization and detection of glaucoma based on anatomical specifications at the optic nerve region. Thickness measurements of the temporal canal nerve fiber layer (CNFL) and temporal retinal nerve fiber layer (RNFL) were obtained from scans of 58 patients diagnosed with primary open-angle glaucoma (POAG) and 25 normal eyes. Results displayed significant decreases in temporal CNFL and RNFL thickness of subjects diagnosed with glaucoma compared to the normal, as well as a high correlation between thinning of CNFL and thinning of RNFL. This data appears to support the hypothesis that CNFL thickness is a sensitive feature that could indicate the onset or progression of glaucoma.

10:15. Sleep deprivation and anxiety exhibited in mice. **Eric M. Joe\***, **Scott Lattimer** and **Kristin M. Hamre**. *Christian Brothers University, Memphis, Tennessee (EMJ), and University of Tennessee Health Science Center, Memphis Tennessee (SL and KMH).*

This research was conducted to determine if any correlation existed between sleep and anxiety as well as, any strain differences in three different genetic mouse strains. One hundred and forty mice of both genders were tested at two age ranges (adolescent vs adult). Sleep Chamber showed time spent sleeping; Elevated Plus Maze and open field Activity Chamber demonstrated anxiety level. Data showed that there existed a strain, gender, and age difference; with younger females showing more anxiety, and strain DBA/2J showing the greatest behavioral increase in anxiety. Results show that there exists an intrinsic strain and gender difference which needs to be taken into account when conducting future behavioral studies and these current results can serve as control baseline data.

10:30. Fibrosarcoma cells expressing CD9 increase matrix metalloproteinase 9 production – a process regulated by epidermal growth factor receptor. **Jessica F. Jameson\***, **Michael J. Herr**, **Scott E. Mabry**, **Lisa K. Jennings**. *Christian Brothers University, Memphis, Tennessee (JFJ), The University of Tennessee, Memphis, Tennessee (MJH, SEM, LKJ).*

Extracellular matrix (ECM) surrounding cells is broken down by matrix metalloproteinases (MMPs) and in general allows cancer cells to metastasize. Previously, our laboratory demonstrated that MMP-9 is upregulated in a human fibrosarcoma cell line (HT1080) that overexpresses the tetraspanin membrane protein CD9. CD9 has been shown to associate with other membrane receptors, such as epidermal growth factor receptor (EGFR) and regulate these binding partners functionality. We examined the relationship between release of pro-MMP-9 and EGFR expression and activity in CD9-HT1080 cells. Treatment with a broad-spectrum receptor tyrosine kinase inhibitor decreased the ability of CD9-HT1080 to secrete pro-MMP-9. Further, EGFR specific inhibitors or knockdown of the receptor was used to demonstrate that EGFR activity and expression, respectively, in CD9-HT1080 cells resulted in enhanced pro-MMP-9 release and subsequent cell invasion. With this knowledge of a CD9-EGFR-MMP-9 axis, future treatments for metastasizing cancers can now be explored utilizing this triad as a target.

#### **10:45. BREAK**

11:00. Diet, not body weight, electrically remodels hypothalamic circuits controlling appetite. **Kevin Pham\***, **Alana Smith**, and **Kristen O'Connell**. *Christian Brothers University, Memphis, Tennessee (KP), University of Tennessee Health Science Center, Memphis, Tennessee (AS, and KO).*

Obesity is a condition caused by poor dietary and lifestyle choices. We investigated the possibility that short-term consumption of high-fat, high-calorie diet (HFD) may induce neuronal changes associated with increased food consumption. Mice were placed on HFD for two different time intervals: one group was fed HFD for  $\leq 48$ h while the other group was fed HFD for  $\geq 8$  weeks. Electrophysiological recording of orexigenic neuropeptide Y neurons within the arcuate nucleus of the hypothalamus showed that chronic HFD consumption increased the output of these neurons compared to standard diet (SD)-fed controls. The rate of spontaneous action potential firing in arcuate neurons in the mice fed short term HFD were similar to those

fed chronic HFD and significantly higher than SD-fed mice. Results suggest that a high fat diet remodels neuronal activity prior to any physical change in weight. (Funding: Neuroscience Merit Summer Fellowship, UTHSC Neuroscience Institute)

11:15. A comparison of letter vs. continuous text contrast sensitivity testing. **Kristen Davis\***, **Marc B. Taub**, *Christian Brothers University, Memphis, Tennessee (KD)* *Southern College of Optometry, Memphis, Tennessee (MBT)*.

Contrast sensitivity is a visual element used in optometric examinations to help assess patient's visual capacity. This study compared two formats of contrast sensitivity tests, ETDRS Letters and Continuous Text, with the intent of determining which format gave higher contrast sensitivity readings. Contrast sensitivity was measured in 75 subjects, who met inclusion criteria, using the Adult Near Contrast Test. Patients' verbal readings provided data for the formats at five contrast levels. Average visual acuity and number of lines/paragraphs read correctly decreased with decreasing contrast. ANOVAs showed significant differences by contrast level in total words and total letters ( $p_s < 0.001$ ) and a Pearson correlation gave high correlations between the contrast sensitivity readings of the two formats except at 100% contrast ( $p_s < 0.05$ ;  $p = 0.69$ ). Analysis revealed that contrast sensitivity readings from the different formats were essentially the same for each contrast level except at 100%. Supported by Southern College of Optometry.

11:30. High throughput screening for protection of hair cell within the Organ of Corti against Cisplatin Ototoxicity. **Russell Higgins\***, **Tal Teitz**, and **Jian Zuo**. *Christian Brothers University, Memphis, Tennessee (RH)* and *St. Jude Children's Research Hospital, Memphis, Tennessee (TT and JZ)*.

In this study a drug screen was performed on six potential candidates to be used as a co-treatment for application with cisplatin chemotherapy. Cisplatin is a common chemotherapeutic agent for solid core tumors that causes extensive damage to cellular DNA and leads to apoptosis of exposed cells. Although cisplatin is an effective antitumor drug, hair cells of the Organ of Corti are sensitive to and therefore damaged by the treatment. Using a cell viability assay the co-treatment candidates were tested for potential protection of HEIOC1, an inner ear cell line cultured from the immortomouse, with exposure to cisplatin. Approximately 10-15% protection was observed in each of the compounds. Our studies suggest that protection of hair cells in the Organ of Corti may be accomplished through multiple unknown mechanisms, an initial but necessary step toward protection of hair cells in cisplatin chemotherapy patients.

11:45. How demographic factors influence the cortisol levels of infants and young children. **Stephanie Allen-Winters\* and Kanjalweet Anand.** *Christian Brothers University, Memphis, Tennessee (SAW), and The University of Tennessee Health and Science Center, Memphis, Tennessee (KA).*

There is growing evidence that chronic maternal stress is associated with adverse outcomes in the neurodevelopment of children. Children are especially susceptible to these negative effects since the stress axis is thought to play a role in their permanent psychological state. A recent methodological development is the use of hair as a biological marker to assess a retrospective record of cortisol levels. The Conditions Affecting Neurocognitive Development and Learning in Early Childhood (CANDLE) is a study that is using this novel approach. Baseline cortisol levels were determined for 902 participants in the CANDLE study. Differences in cortisol levels controlled for cohort, race, and socioeconomic status yielded significant findings suggesting that these factors may influence cortisol levels in pediatric populations. However, gender did not affect baseline hair cortisol levels suggesting that sex-related differences in cortisol do not emerge until puberty. Funding for this study was provided by the UTHSC Neuroscience Fellowship.

12:00. Analysis of expression patterns of tuberin and hamartin in mice with high fat diets. **Elton Banks\*, Deborah Azzi-Nogueira, A.C Rodrigues, A.S Torrão, L.A Haddad and L.R.G Britto,** *Christian Brothers University, Memphis, Tennessee (EB), The University of São Paulo, São Paulo, Brazil (DA, AR, AT, LH, LB).*

Tuberous Sclerosis Complex (TSC) is an autosomal dominant disorder resulting from mutations in either *Tsc1* or *Tsc2* genes, which encode proteins hamartin (TSC1) and tuberin (TSC2). Together, TSC1 and TSC2 act as a tumor suppressor complex important in suppressing growth and proliferation of cells. It has previously been noted that a high fat diet (HFD) in mice may have the capacity to lead to abnormal regulation of the TSC1-TSC2 complex via Akt signalling, possibly leading to neurodegeneration. In this study, Western blotting and qPCR analysis were used to determine what effect a HFD has on the gene expression in the cerebral cortex of mice. A significant reduction in *Tsc1* and *Tsc2* mRNA in the cortex of HFD mice was observed when comparing control mice. However, due to the small sample of animals, data from Western blotting were not statistically significant.

12:15. SepG in *Aspergillus nidulans* encodes an IQGAP protein. **Kristen E. Wendt\* and Terry W. Hill.** Rhodes College, Memphis, Tennessee (KW and TH).

A long-standing mystery in the study of fungal cytokinesis is the identity of the *sepG1* mutation, first reported in 1994, which blocks formation of crosswalls (septa) during division. We have succeeded in identifying *SepG* as *Aspergillus nidulans* gene AN9463, predicted to encode an IQGAP scaffolding protein. The mutation in AN9463 (5333 nucleotides) is a G-to-A transition at position 5082, resulting in a predicted arginine-to-glycine substitution at residue 1637 of the 1737-amino acid product. The mutant phenotype is complemented by the cloned wild type allele. The GFP-tagged IQGAP colocalizes with actin and myosin during cell division. Although down-regulation of the gene under a regulatable promoter blocks septum formation, it does not prevent actin and myosin from associating as a ring in the initial stages of septation. Thus, we conclude that IQGAP plays a role in enabling the actin/myosin ring to contract in cytokinesis, but it is not necessary for ring formation.

Engineering  
Session Three  
Moderator: Dr. John Varriano

9:45. The production of a quadcopter. **John Vo\***; *Christian Brothers University, Memphis, Tennessee (JV)*.

The age of remotely controlled vehicles and aircraft is rising due to a need for convenience, and effectiveness without putting a human life in danger. The scope of this project is designing, constructing, and implementing a quadcopter. The characteristics of the quadcopter will be similar to a miniature version of a drone that the military uses to do surveillance and transportation. The project will include the organizing, planning, building, and testing of a quadcopter. The mission of the project is to have an interactive iPhone application that can control a quadcopter while showing what the quadcopter is viewing on an attached webcam. As a result, the quadcopter will be able to fly using an iPhone application as a remote controller.

10:00. Escape from the minefield. **Shilpa Appurubugatha\***, **Sean Dantis\*** and **Matthew Winters\***, *Christian Brothers University, Memphis, Tennessee (SA, SD, and MW)*.

In 2003, Ray and Joan Kroc donated \$1.5 billion of matching funds to the Salvation Army to construct 30 Kroc Community Centers. The centers provide facilities for K-12 students to play games that contain puzzles and tasks that intellectually challenge and stimulate players. The goal of this project is to design an interactive environment for young people to carry out missions that promote team building and improve mathematical skills. The work includes the organizing, planning, building, and testing of the devices and components used in the puzzles and games. All missions should be fun and educational and meet the requirements of the Salvation Army to serve the youth of all ages in the Memphis Area.

10:15. IEEE SoutheastCon 2014 hardware competition. **Jerry W. Counce\***, **Cody R. Crow\***, **Michael B. Powers\***, *Christian Brothers University, Memphis, Tennessee (JC, CC, MP)*.

The purpose of this project was to design and implement an autonomous robot for the 2014 IEEE SoutheastCon Hardware Competition. The robot had to be able to traverse a simulated a basketball court and fire a dart from three randomly placed firing blocks without any third-party interference. The robot was split into three modular components: the movement component, the firing apparatus, and the targeting system. The movement component consisted of the chassis and was controlled by an Arduino Mega microcontroller. The firing apparatus consisted of three NERF guns that could be positioned and fired via servo motors. The targeting system consisted of a Beaglebone Black microcomputer, a Logitech C920 webcam, and image processing software. The robot successfully competed in the 2014 IEEE Southeastcon Hardware Competition.

10:30. Challenge Center's Activity: "Lost in the Jungle." ***Mitchell Clayton Moorehead\* and Charmaine Cooper\****, *Christian Brothers University, Memphis, Tennessee (MM and CC)*.

The Memphis Salvation Army Kroc Center was built in 2013 after a \$1.5 billion donation was made by Ray and Joan Kroc to construct up to 30 Kroc Centers across the United States. The Memphis Kroc Center contains many different facilities like basketball courts, soccer fields, a fitness center, a theatre, the Challenge Center, etc. The Challenge Center is composed of several interconnected themed rooms, which are built around interactive activities that challenge participants and promote team building. Each activity is composed of objects such as sensors, buttons, lights and sound effects to make interactive activities. The design process for each activity requires planning, design, building, and testing of the devices and components used in the activities. The activities should be designed so that the activities are not only fun, but also educational to the participants.

10:45. The smart cube solver. ***Adam Tekle\* and Viet Minh Tong\****, *Christian Brothers University, Memphis, Tennessee (AT and VT)*.

The Smart Cube Solver is a robot whose purpose is to solve a Rubik's Cube. Its objective is to identify the cube's initial state, to find a solution, and to apply the solution. The robot utilizes a BeagleBone Black microprocessor that connects to a Logitech C920 webcam in order to analyze the cube, and a pair of robotic arms that manipulate the cube by simulating a right and left hand. Each robotic arm consists of a pair of Dynamixel AX-12A servos. Each servo allows for precise rotations to an integer degree. The robot finds a solution to the cube using Thistlethwaite's algorithm, which generates a solution consisting of at most forty-five moves in several seconds. As a result, the robot is capable of solving a Rubik's cube independently in a matter of minutes.

Posters  
Session Four

1. Morphological characterization of hemoparasites from small mammals living in forest fragments in Paraguay. **Aubrey G. A. Howard\***, **Monali Lipman\***, **Alisha Patel\***, **Pastor Pérez-Estigarribia**, **Noé de la Sancha**, **Sarah Boyle**, **Laura E. Luque**, *Rhodes College, Memphis, Tennessee (AH, ML, AP, SB, LL)*, *Universidad de Concepción, Chile (PP)*, *Chicago State University, Chicago, Illinois (NS)*.

The effects of deforestation on biodiversity are poorly understood and can lead to stress, disease, and immunosuppression in species that rely on forested habitats. Currently, intense deforestation is occurring in Paraguay's Interior Atlantic Forest, a region once rich in biodiversity. In this study, we are examining the effects of deforestation and fragmentation on the health of small mammalian populations found within this region. During summer 2013, 134 blood samples were collected as smears from terrestrial and arboreal rodents and marsupials in six fragments. Samples were taken retro-orbitally or from heart tissue. Using light microscopy, 26 slides were examined with 17 slides showing infection. The pathogens found have been morphologically classified in the Apicomplexa, Helminth, or Protobacteria phyla. By understanding the impact of fragmentation and deforestation on mammalian health, we hope to provide information that will help preserve the biodiversity of this region and assist with conservation management plans.

2. The effect of opportunistic potential-stressor on urinary cortisol levels of a female Sumatran tiger. **Jennifer J. Marshall\***, **Erin Loeding**, and **Beth Roberts**, *Rhodes College, Memphis, Tennessee (JM)*, and Research and Conservation Department at the *Memphis Zoological Society, Memphis Tennessee (EL, BR)*.

The primary objective of the current study is to examine the effect of an opportunistic potential-stressor on urinary cortisol levels of a female Sumatran tiger. Samples were collected 3 to 5 times a week before, during, and after an extended change in husbandry routine due to an unusually severe winter. Cortisol concentration will be measured using enzyme immunoassay and adjusted for water content using urinary creatinine concentration. Cortisol concentrations (mean  $\pm$  SD) for month before, during, and after the husbandry change will be compared. Urinary cortisol levels are expected to be significantly higher during the change in routine versus the months before and after. No difference is expected between the month before and month after. This data will help us to determine if urinary cortisol increases with change in husbandry routine, if it is measurable non-invasively, and give us a better understanding of the female's average baseline and peak cortisol levels.

3. Visual mechanisms in copepod mating behavior: the effect of light on mating frequencies in *Labidocera aestiva*. **Margaret R. Blake\*** and **Jonathan C. Cohen**, Rhodes College, Memphis, Tennessee (MB), and College of Earth, Ocean and Environment, University of Delaware, Lewes, Delaware (JC).

Calanoid copepods are a type of zooplankton found in ocean and freshwater habitats. Vision is considered to be of little importance to this group of organisms as their eyes are typically not complex or nonexistent. The family of pontellid copepods are an exception, as they possess more elaborate eyes. The presence of more complex eyes suggests that these copepods utilize visual information to a greater degree. To determine if vision affects the behavior of pontellid copepods, male-female pairs of the copepod *Labidocera aestiva* were bottled and incubated under light and dark conditions. A difference in the frequency of mating in these light conditions would support the hypothesis that vision is used in mating. No significant difference in mating was observed between the light and dark levels tested. Future tests may include running mating trials on larger sample sizes in different bottle volumes to determine if a significant difference exists.

4. The influence of kinship on the presence of aggressive behaviors between Nile hippopotamuses (*Hippopotamus amphibius*) in Captivity. **Sunanda Mattancheril\***, **Roberta Moore\*** and **Sarah Boyle**, Rhodes College, Memphis, Tennessee (SM, RM, and SB).

Kin relationships, familiarity between individuals, age, dominance hierarchies, and sex may all contribute to social interactions between hippopotamuses (*Hippopotamus amphibius*). The Memphis Zoo housed two related hippopotamuses, Julie (51 years old at death) and Splish (~25 years old), during the beginning of behavioral data collections in August 2012. After Julie's death in March 2013, another unrelated hippopotamus, Binti (~13 years old), was introduced to the exhibit in June 2013. In order to elucidate the role of kinship in social interactions between hippopotamuses, 382 hours of behavioral interactions were recorded via scan sampling at 2-minute intervals, along with ad libitum sampling of agonistic behavior, and analyzed between the two pairs of hippopotamuses. Because relatedness is associated with increased inclusive fitness, we predict that kinship has the greatest effect on reducing presence of aggressive behaviors between hippopotamuses. Our findings of social interactions between hippopotamuses in captivity can aid in determining hippopotamus groupings.

5. Arboreal mapping of the Memphis Zoo, **Mary E. DuBose\***, **Taylor Sieben\***, **John F. Menz\***, **Roberta Moore\***, **Rachel S. Jabaily**, **Connie Shepherd**, and **Sarah A. Boyle**, Rhodes College, Memphis, Tennessee (MED, TS, JFM, RM, RSJ, SAB) and the Memphis Zoo (CS).

The goal of this project is to develop a comprehensive map and catalog of the trees throughout the Memphis Zoo. This project involves geotagging each tree with a handheld GPS unit, measuring the diameter at breast height (DBH), and identifying the genus and species. Further background research, such as native or non-native status and botanical family, is also included in the database. So far, over 2,000 individual trees have been recorded, representing 97 species and 59 genera. Individual tree locations, species distribution and density, and tree diameter were mapped using Esri ArcMap 10.1 software. This research has implications for the Memphis Zoo's horticulture department as they create management strategies for the Zoo landscape. In an attempt to promote sustainability, they will be able to use these data to make more informed decisions about tree planting and removal.

6. Visual acuity and genetic classification of subjects with either Type I or Type II Oculocutaneous Albinism. **John D. Wolfe\***, **Ronaldo Y. Sano**, **Einat Hanzman**, **Daniela M.O. Bonci**, **Malinda Fitzgerald**, **Dora F. Ventura**, Departamento de Psicologia Experimental, Instituto de Psicologia, Universidade de São Paulo, São Paulo, Brazil (JW, EH, DB, DF, RS), Departamento de Oftalmologia da Santa Casa de Misericórdia de São Paulo, São Paulo, Brazil (RS), Department of Biology, Minority Health and Health Disparities International Research Training Program, Christian Brothers University, Memphis, Tennessee (JW, MF), Instituto Israelita de Ensino e Pesquisa, Hospital Israelita Albert Einstein, São Paulo, São Paulo, Brazil (EH, MB, DF).

Albinism is a genetic disease in which different mutations can cause the absence or reduction of melanin, leading to ophthalmological changes that may include severe visual loss. The purpose of this study was to screen the TYR and the P gene of albino subjects in a Brazilian cohort comparing the results with previous dermatological diagnoses. In addition, to correlate visual acuity to an individual's respective type of albinism. Of the 11 albino subjects, 3 had mutations in the TYR gene (OCA1) and 8 in the P gene (OCA2). There were differences between visual acuities of individuals who had the same type of albinism. The correlation drawn in this study between general visual acuities and OCA1/OCA2 individuals, along with the ongoing investigation of Brazilian albinos, can serve as a basis from which a more precise, efficient diagnosis and treatment standard can be formed for the genetic disorder of albinism.

7. Continuous time quantum random walks. **Rebekah Herrman\*** and **Travis Humble**, *Christian Brothers University, Memphis, TN (RH) and Oak Ridge National Laboratory, Oak Ridge, TN (TH)*.

Continuous Time Quantum Random Walks are used to simulate how a quantum particle propagates along a graph. The path that the particle follows depends on the Hamiltonian of the system, which is equivalent to the adjacency matrix of the graph. Over the summer, we used Mathematica software in order to simulate how a particle would propagate along varying graphs, specifically the K2 and the Binary Welded Tree graphs. We then constructed quantum logic gates based on the times that it took for a quantum state to propagate from one vertex of the graph to another and on the way that the initial wave function evolved as a result of the propagation. Then, we created simple circuits using the quantum logic gates, which can then be used to simulate quantum teleportation.

8. Burrowing habits and morphology of salamanders in genus *Ambystoma*. **Megan Mosier\***, **Marie Ryall\***, **Lynda Miller**, *Christian Brothers University Memphis, Tennessee (MM, MR, and LM)*.

Knowing that burrowing habits differ among salamander species, we conducted a morphometric study to determine if a correlation between burrowing habits and body size exists. Some salamander species actively create their own burrows while others use existing animal burrows or are aided from cracks in the soil. We measured three different species of salamanders, *Ambystoma tigrinum*, *A. texanum*, and *A. opacum*. We found that allometric measurements of *A. tigrinum* were significantly different than measurements of the other salamander species. *A. tigrinum* is the only species of these that is known to actively dig its own burrows. *A. texanum* and *A. opacum* are known to use already existing burrows or cracks in the soil.