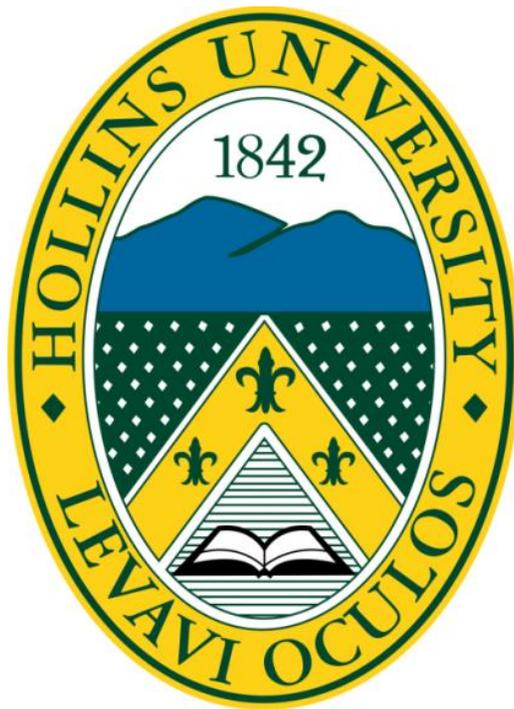


# Hollins University



## 59<sup>th</sup> Annual Science Seminar

Thursday, April 28<sup>th</sup>  
4:30-6:00 p.m. Ballator Gallery

*We are pleased to have you join us as we celebrate the research conducted by science and mathematics students at Hollins University during the 2015-2016 academic year.*

*We encourage you to engage our students in discussion about their research, which is summarized in this poster session. Students will be available for questions about their work from 4:30-6:00 p.m.*

*Light refreshments will be provided*

# Department of Biology

## **Use of Chemodetection by Passerines to Assess and Avoid Predation Risk**

**Sam Cline**

Under the direction of Drs. Renee Godard and Morgan Wilson

Many species use olfactory cues to detect predators; however, relatively few studies have examined this ability in passerines and the collective conclusion from these studies has been equivocal. In this study, we simultaneously exposed birds to feeders laced with bobcat urine, garlic extract, or water. . We compared the time it took birds to first approach a feeder, the time spent feeding, the number of non-feeding departures, and the presence of vigilance while at each feeder. There were no differences in any of these responses between birds at feeders with the different scent cues. However, we did note that birds were more vigilant, had more non-feeding departures, and took longer to begin feeding on the day that scent cues were added, when compared to the data from the previous day, when no scent cues were present. Our results suggest that scent cues may impact avian behavior, but we were unable to determine if it was the predator cue itself or simply the presence of novel odor cues. Our findings are tantalizing, and warrant further study with a refined experimental design that will allow us to elucidate the changes in behavior that were observed.

## **Tick Species Richness in relation to Acaricide Treatment and Host Characteristics**

**Rikki Martinez**

Under the direction of Dr. **Christian Kiffner**, School for Field Studies

We investigated species richness of ticks in relation to body mass, sex, and acaricide treatment on cattle and sheep in Northern-Tanzania. The study was conducted among Manyara Ranch from a total of 11 herds and consisted of 42 cows and 20 sheep. A total of ten tick species were identified. From the data collected we identified the highest percentage of tick species found on cattle were *R. pulchellus* and *A. gemma*. For sheep it was *R. pulchellus* and *R. praetextatus*. Data analysis found no significant relationship between species richness of ticks and body mass, sex, or acaricide treatment on cattle. No significant relationship between species richness of ticks and body mass or sex on sheep was also found. These findings imply that there are no biases towards size or gender and that tick species are not species-specific. The results from treatment indicate that acaricide has no effect on the species of ticks that infest a single host. This suggests that management should be focused more on the control of individual tick species so that treatment can be specialized to target the pathogen they are vectors for.

**Potential of Vegetation to Support Beekeeping in the Endabash Area, Tanzania**  
**Katarina Vandish**

Under the direction of Dr. John Mwamhanga, School for Field Studies, Tanzania

Beekeeping has many economic, social, and environmental benefits. The ecosystem and pollinators of Endabash depend upon one another to thrive. Thus, this study sought to assess the abundance and diversity of the melliferous plants in Endabash to determine the potential of the vegetation alone to support beekeeping activities. Data about species of melliferous plants in the area were collected from forest walks, while data about the interactions between melliferous plants and the people of Endabash were collected in the form of semi-structured questionnaires and two focus group discussions. This study determined that the Endabash community forest has a high diversity (0.89) and species evenness, which indicates good forest health. As such, this study suggests no direct management plan of the melliferous plant populations, but to maintain and monitor the health of the community forest.

**Cymothoid Isopod Parasitism on Nearshore Reef Fish of St. John, USVI**  
**Christina Havrila and Morgan Wilson**

Under the direction of Drs. Morgan Wilson and Renee Godard

Cymothoid isopods are obligate crustacean parasites that affect fish. The effects of isopod infestation range from scale deterioration, to reduced fitness, to alteration of host behavior. In this study, we observed French Grunts (*Haemulon flavolineatum*), Brown Chromis (*Chromis multilineata*), Four-eye Butterflyfish (*Chaetodon capistratus*), and Banded Butterflyfish (*Chaetodon striatus*) and recorded presence or absence of isopod(s), social structure, and resting position of each fish. We found that fewer isopod-infected fish were encountered in mangroves than in areas with colonized pavement, and that French Grunts were the most frequently parasitized fish species. Further, parasitized French Grunts were found alone significantly more often, while Brown Chromis tended to be found more often in aggregates. Finally, isopod infection did not seem to affect the resting position of French Grunts. This study provides a good base of information that will be helpful in studying isopod infection and their effects on fish social structure.

**Survey of Sea Grass Composition:**  
**Determining the Extent of *Halophila stipulacea* Spread**  
**Emma Nixon**

Under the direction of Drs. Renee Godard and Morgan Wilson

Seagrasses are important in a healthy coastal marine ecosystem. They provide food, habitat, serve as nursery for small fish and invertebrates, and reduce turbidity by trapping sediments on the sea floor, therefore maintaining water quality. Without seagrass, coastal marine ecosystems do not have a stable primary producer to fuel the food web. Seagrass was assessed using a 1/2 m<sup>2</sup> grid divided into 25 quadrants which placed randomly 10 times along a 100m transect. Percent seagrass coverage as well as species composition was assessed. Most seagrass beds had high coverage with *Thalassia testudinum* as the most dominant species, followed by *Syringodium filiforme*/*Halodule wrightii*, and the invasive *Halophila stipulacea*. This study provides baseline data on grass bed structure and will be critical for understanding future impacts of the invasive seagrass.

**Coral Health and Abundance in Relation to Human Pressure**  
**Natasha Bestrom, Ashleigh Leas, Lainey Metz, and Carly Todd**  
Under the direction of Drs. Renee Godard and Morgan Wilson

Coral is important in a healthy ecosystem. Reefs provide critical habitat for marine organisms, as well as, provide other environmental benefits (e.g. wave action barriers). Using 10m x 2m transects, the average number, size, and relative health of coral was assessed in 3 mangrove sites and 9 colonized pavement sites in St. John, USVI. Small coral were the dominant size class at all sites with a higher coral species diversity in colonized pavement than in mangroves. The average health for coral in most sites was scored at 50-75% healthy. In the two locations sampled in both 2015 and 2016, an overall decline in health score was noted. Although bleaching was observed in 2016, it did not account for this decline. Further comparisons of more sites will provide more information on coral health trends in the USVI.

**Patterns of Fish Biodiversity in St. John USVI**  
**Samantha Cline, Jessica Michael, Sunny Greene, and Renee Godard**  
Under the direction Drs. Renee Godard and Morgan Wilson

Marine biodiversity and health is influenced by structure and location. Our study compared fish biodiversity and abundance patterns in 3 habitat types on St John from 2015 to 2016. Twelve sites were surveyed by collecting 30 minute biodiversity samples. Species as well as relative abundance patterns were noted. Species numbers increased from 2015 to 2016 and the percent of abundant and common species increased while occasional and rare species decreased. In 2016, the largest percentage of species in all locations were classified as rare with relatively few species classified as abundant. There was a non-significant trend towards fewer species in mangrove habitat when compared to northern and southern colonized pavement. Of the seven species of parrotfish noted, initials were more abundant than terminal for all species. These patterns are of interest and these data provide a valuable baseline for comparison of diversity in future years in a changing ecosystem

# Department of Chemistry

## Synthesis of Dirhenium Complexes

Rikki Martinez

Under the direction of Dr. Daniel Derringer

The main goal of the research was to synthesize some dirhenium compounds that have a particular structural feature we refer to as *cis,cis*. Most of the reactions involving rhenium were carried out in an inert atmosphere of dry dinitrogen. Several methods of analysis, including NMR spectroscopy, cyclic voltammetry, and IR spectroscopy, were used to characterize reaction products. Because of problems with reagent purity, the main goal of the project was not achieved.

## Condensation of Dimethyl Phthalate with Acetylacetone: An Unexpected Result

Kaitlyn M. Hall

Under the direction of Dr. Sandra Boatman

Synthesis of the yellow compound 2-acetoacetyl-1,3-indanedione gave a significant amount of a second product, a red compound, not mentioned in the publication from which the synthesis was taken. Tests and a synthesis are being performed to determine the structure of this unexpected product.

## Fluorescence

Rikki Martinez

Under the direction of Dr. Sandra Boatman

The objectives of this research were to explore the fluorescence characteristics of several compounds in a variety of conditions and to develop experiments that will help students to understand how fluorescence occurs and how it can be used in analysis. Absorption of a particular energy of light by a compound that fluoresces results in the emission of a fluorescence spectrum. The Pasco spectrophotometer that was used for these experiments only has excitation wavelengths at 405 and 500 nm, so we first had to determine that our compounds absorbed at one of those wavelengths. Visible spectra were obtained for all compounds, and an excitation wavelength was determined for each. Then their fluorescence spectra were determined. It was observed that concentration of the samples affected both the absorbance and fluorescence. Varying the polarity of the solvent caused shifts in fluorescence intensity and wavelength with some compounds. With all compounds, both qualitative and quantitative measurements were made, and a range of concentrations determined where fluorescence varied linearly with concentration. Several experiments were developed that fulfill the goals of this research.

# **Environmental Studies Program**

## **Morphology and Niche Partitioning of Fish Assemblage in the Tonle Sap Biosphere Reserve – a Case Study of the Prek Toal Core Area**

**Lan Thi Ngoc Nguyen'18**

Supervised by: Dr. Chouly Ou, School for Field Studies Cambodia

Morphological studies illustrate community structure and ecological adjustments among different species in the same habitat. The coexistence of competing species in a diverse community results in niche partitioning to increase stabilization. This study tests the relationship between morphology and niche partitioning to understand the coexistence of diverse fish assemblages in the Tonle Sap Biosphere Reserve, one of the world's most productive inland wetlands, a tropical river ecosystem that supports high biodiversity, especially fish population. By measuring 31 morphological variables and gathering ecological data of the collected 27 fish species, this study applied principal component analysis and cluster analysis to examine the influence of morphology on the ecological niches of the fish assemblage. The results of the study demonstrate that the diversification in morphological characters directly determine niche partitioning of the fish assemblage in the Tonle Sap Biosphere Reserve.

## **Traditional Medicine Usage and the Transmission of Traditional Ecological Knowledge in Three Villages Near Phnom Kulen National Park**

**Kayla N. Deur with Hang Chansophea**

Supervised by Dr. Lisa Arensen, The School for Field Studies, Cambodia

Traditional ecological knowledge (TEK) refers to knowledge regarding the relationships between humans and the natural environment. This knowledge and skill set is acquired by local and indigenous peoples through generations of direct contact with the environment and is often shared in an intergenerational pattern of verbal retelling and instruction. Traditional medicine is one component of TEK, and this research outlines the investigation of such knowledge in three villages near Phnom Kulen National Park (PKNP) in Siem Reap, Cambodia. This study was conducted through semi-structured interviews at homes that were either randomly or intentionally selected. A total of 111 plants were described by 27 interviewees. Fifty-two species described are used for treatment during pregnancy and the postpartum period, while other common medicinal purposes listed include treatment of cold, flu, stomach ache, or diarrhea. The respondents (20 female, 10 male) ranged in age from 27 to 81 years old, and each was able to describe some medicinal plants and their uses. Twenty-three respondents learned about traditional medicine from their parents or grandparents, implying that intergenerational transmission of knowledge is the most common mechanism encountered. Data from this study indicate that TEK about traditional medicine persists, and traditional medicine is still widely used in the three villages studied.

## **Environmental, Socioeconomic and Personal Concerns of Visitors to St. John, USVI**

**Cindy Newell and Emma Nixon**

Under the direction of Drs. Renee Godard and Morgan Wilson

St. John, the smallest of the islands comprising the United States Virgin Islands, is among the most visited in the Caribbean. Unlike many other islands, two-thirds of this island is under the protection of the National Park Service. Despite this, the island's land and marine ecosystems are still threatened. As such, a survey was designed to capture the importance of environmental, socioeconomic, and personal comforts to visitors of St. John. We hypothesized that students and tourists who had visited the island multiple times would place the greatest importance on environmental and socioeconomic issues. Furthermore, we were interested in determining how visitors rank environmental and socioeconomic issues compared to issues of personal comforts. Visitors of 10+ visits did not rank all three of the environmental issues as the most important and students ranked personal comforts higher than most socioeconomic issues. Continued study may reveal a relationship between environmental and socioeconomic issues and may demonstrate patterns of the change in awareness of visitors over time.

## **Mucilage Production in the Tree Fern Species, *Alsophila cuspidata* and *Cyathea microdonta***

**Melissa Manow '16, Biology/ES Major**

Supervised by: Dr. Adrian Tejedor; SFS Peru Spring 2015

Mucilage from *Cyathea microdonta* and *Alsophila cuspidata* are used by Peruvians to treat wounds. This study sought to determine rates of production of mucilage from fronds and trunks of these two species. Mucilage production from trunks was significantly higher than that of fronds and the rates of production for trunks and fronds were different over the first 8 hours of production, suggesting that it is more efficient to collect mucilage from trunks. Fortunately, harvesting trunks in these species does not result in mortality, as they produce multiple trunks.

## **Urchin (*Diadema antillarum*) Populations in Relation to Coral Health and New Coral Growth**

**Natalie Badawy and Brittany Richardson**

Under the direction of Drs. Renee Godard and Morgan Wilson

Coral reefs are dependent on organisms that are algal grazers such as parrotfish and sea urchins. *Diadema antillarum* are incredible grazers that have an intimate relationship with coral. *Diadema* support the coral by keeping the algae from overgrowing thus inhibiting coral growth and fish diversity. According to Lessios et al. (1984), the condition of USVI coral reefs have been significantly impacted by a die-off of *Diadema*, creating a reef dominated by macroalgae. As *Diadema* populations rebounded an increase in the abundance of juvenile corals was noted in 2001 (Edmunds and Carpenter 2001). In our 2016 study, we surveyed *Diadema* at 13 locations and compared their population estimates to the five sites sampled in 2015 study, as well as to coral health surveyed in 2016. We found that *Diadema* populations remained the same at sites sampled in 2015 and 2016, suggesting that *Diadema* numbers may have stabilized in the waters of St. John. We found no relationship between *Diadema* populations and coral density, or the number of juvenile corals, unlike the 2001 study. The change in our methodology from 2015 to 2016 proved to be more effective and consistent, and will provide useful information on future changes in *Diadema* populations.

**A Five Year Study of Trash Removal on Two Sandy and Two Pebble Beaches in St. John, USVI  
Renee Godard, Morgan Wilson and Caribbean Ecology Students (2012-2016)**

The World Bank estimates that humans throw away 4 billion tons of waste everyday with 9 billion tons of plastic entering marine ecosystems annually. In an effort to respond to this problem, participants in the January Caribbean Ecology course have picked up trash from two sandy beaches and two pebble beaches on St. John from 2012-2016. All items were counted as originating from land or sea and totals as well as weight of trash from beaches were compared. On average 81% of trash on sandy beaches originated from land as compared to 15% of trash on pebble beaches. Annually, we have removed an average of 6400+ items (most marine) and 110 pounds from these beaches. Unfortunately, these efforts have not resulted in a decline in trash from one year to the next.

## **Department of Physics**

### **Fluorescence Microscopy with F-Actin & Microtubules**

**Lauren Chin and Felicity Mampe**

Under the direction of Dr. Brian Gentry

Eukaryotic cells depend upon the biopolymer-based cytoskeleton for structural support of the cell membrane, cell division, intracellular transport, and cell migration. In solution, the cytoskeletal biopolymers F-actin and microtubules behave as stiff rods and will spontaneously order into nematic liquid crystals at high concentrations. These filaments were reconstituted and observed in vitro using fluorescence microscopy to study their ability to order when mixed in solution.

# Department of Psychology

## **The Relationship Between Humans and Nature: A Study on Nature-Relatedness, Subjective Well-Being, and Gratitude Emily Dodson**

Under the direction of Dr. Tiffany Pempek

In the past few decades, research has expanded on the relationship between humans and nature. In particular, this research has focused on nature-relatedness, or the level of association and personal identification with the natural world, which is linked to several positive psychological factors such as well-being, personal growth, vitality, and life satisfaction. The current study expands on previous research by further examining the association between nature-relatedness, well-being, and gratitude. Seventy-six individuals completed a 173-question online survey, which included measures of nature-relatedness in childhood and adulthood, gratitude, subjective well-being, and satisfaction with life. As predicted, nature-relatedness was significantly correlated with gratitude and childhood nature-relatedness. However, counter to what was predicted, nature-relatedness was not related to satisfaction with life or happiness. This research highlights the relationship between nature and several psychological factors. Future experimental research might further assess nature-relatedness and gratitude in order to inform recommendations for nature exposure in childhood and adulthood.

## **The Effect of Non-Social Interactivity on Toddler's Learning from Video Caitlin Kelley**

Under the direction of Dr. Tiffany Pempek

With the rapid growth of technology, many children are being exposed to screens from an early age. Media products for infants and toddlers are often advertised as educational. However, research shows that children learn less from video compared to an equivalent live presentation. This is known as the video deficit, an effect that disappears around the age of 30 months. The purpose of this ongoing experiment is to assess the video deficit and examine if interactivity provided by touching a tablet computer will eliminate the video deficit for children less than 30 months of age compared to those 30 months and older. This ongoing study included 25 children ages 24 to 37 months old ( $M = 30.24$ ,  $SD = 3.89$ ) who were recruited via flyers, magazine advertisements, and social media. The children played a brief hide-and-seek game in which they attempted to find "Sammy the Turtle" in one of four hiding spots. The information children received regarding Sammy's hiding spot differed in terms of interactivity (pointing or looking) as well as viewing method (live or video). This resulted in four randomly assigned conditions, including: (1) live interactive, (2) live non-interactive, (3) video interactive (i.e., tablet), and (4) video non-interactive. Preliminary results revealed a marginally significant age difference for the average number of errorless retrievals. There was also a significant video deficit for younger children. That is, they did better in the live conditions than in the non-interactive video (tablet) condition. This was not true for older children, who did equally well in both live and video conditions.

## **Visual Discrimination Learning in Corn Snakes (*Pantherophis guttatus*)**

**Caitlin Bishop**

Under the direction of Dr. Bonnie Bowers

This study investigates the visual discrimination learning of corn snakes (*Pantherophis guttatus*) using four individual corn snakes, two males and two females. The snakes were trained to associate black-or white-colored feeding dishes, randomly assigned to each snake, with food and then were tested on their preference when both colors of dishes were presented simultaneously. The research examines snakes to find ascertain if they, like other reptile species, are capable of visual discrimination learning.

## **Pilot Study of Spatial Learning Ability of Juvenile Corn Snakes (*Pantherophis guttatus*)**

**Lindsay Flanary**

Under the direction of Dr. Bonnie Bowers

This study examines the spatial learning ability of juvenile corn snakes (*Pantherophis guttatus*) in a previously unexplored arena. It is known that corn snakes possess the innate ability and tendency to climb, specifically while pursuing prey. While the ability of this species to navigate and memorize Y-shaped maze arenas is known, this study is the first known to the authors that explores the ability of corn snakes to traverse a vertical maze arena through the implementation of prey incentive. While the study yields no statistically significant results, it does expose behavioral tendencies of climbing corn snakes and offers suggested changes to the experimental design that complement observed behaviors. The most significant suggested change is to move the access points to each level from open areas to corners, where participants spent the most time. Additional design suggestions include building the maze structure from a warp-resistant material such as a glass or acrylic and changing the between trial cleaning method from washing with soap and water to an easily removable and replaceable paper shelf covering.

## **Supernatural Belief and Social Relationships**

**Rachel Loberger**

Under the direction of Dr. George Ledger

The relationship between the degree of closeness of female friendships and the perceived similarity in their beliefs concerning the supernatural were examined. Subjects completed two friendship rating questionnaires and two questionnaires concerning belief in supernatural phenomena and engagement in superstitious behavior. The results showed high correlations between the degree of closeness of the friendship and the perceived similarity of beliefs in the supernatural. The findings suggest that the similarity beliefs in supernatural form an important part of friendship in college-age women.

