12:15 - 1:15 p.m. **Fungi In A Warmer World An Overview Of Fungi During The Middle Miocene Climate Optimum**

ℙ–4

Savannah Jones, Jolene Fairchild, Jonathan Rose, Tyler Spears, Laikin Tarlton. Dr. Ingrid Romero, Dr. Jennifer O'Keefe, mentors, **Department of Physics, Earth Science and Space Systems Engineering, College of Science**

Fungal activity is a key driver of terrestrial carbon cycling, and the distribution and diversity of fungi are closely related to local ecosystem structure. This makes fungi a powerful tool for understanding how ecosystems react to climate change, however the long-term, large-scale datasets needed to do this do not exist, and cannot be built on the timescale of single human lifetimes. They can, however, be built from the fossil record, although, to date, we do not have enough information about the composition of fossil fungal communities to generate accurate models to use to predict fungal responses to today's climate crisis. The "Fungi in a Warmer World" (FiaWW) project is tasked with building the first dataset of this kind. Students affiliated with FiaWW are studying the fungal assemblage composition and diversity preserved in rocks deposited during the Middle Miocene Climate Optimum, the warmest interval of the last 16 million years, and considered the best analogue for the modern-future climate scenarios. By analyzing samples from different places around the world, we can determine how 1) fungal biodiversity, 2) the frequency of phytopathogens, and 3) the distribution of agriculturally important fungi changed in relation to climate change. In collaboration with scientists at Northumbria University, we will use this information to model fungal community response to future climate change. Here we present the framework for our overall study.

12:15 - 1:15 p.m. **Fungi In A Warmer World Fungal Diversity In The Tropical Middle Miocene Climate Optimum Forests Of Australia**

ℙ–46 ***Laikin Tarlton, Jolene Fairchild, Savannah Jones, Jonathan Rose, Tyler Spears. Dr. Ingrid Romero , Dr. Jennifer O'Keefe, mentors,*** **Department of Physics, Earth Science and Space Systems Engineering, College of Science**

Fungi are extremely important components of our environment; knowing fungal biodiversity provides key information about ecosystem dynamics, especially about carbon cycling. Here we present an overview of fungal biodiversity as recorded in 16.6-14.8 million year old lignite seams from the Gippsland Basin, Australia. This interval of time includes the Middle Miocene Climate Optimum (MMCO), a warm period that is a potential analog for understanding the impacts of modern climate change. All lignite samples are from the Yallourn Seam of the Latrobe Valley Group, and have been extensively studied using plant palynology, organic petrography, and stratigraphy to produce a detailed paleoecological record for the area across the MMCO. However, the fungi preserved in these coals have never been studied. Here we present the first overview of fossil fungal diversity from the Yallourn Seam. This study lays the foundation for predicting future fungal biodiversity in similar ecosystems during predicted modern climate change.

12:15 - 1:15 p.m.

Fungi In A Warmer World Fungal Diversity In The Tropical Middle Miocene Climate Optimum Forests Of Thailand

P–47

***Jolene Fairchild, Jonathan Rose, Laikin Tarlton, Savannah Jones, Tyler Spears*. Dr. Ingrid Romero Valero, Dr. Jennifer O'Keefe, mentors,* Department of Physics, Earth Science and Space Systems Engineering, College of Science**

Fungi are excellent but under-utilized resources for understanding and predicting climate change. As heterotrophic organisms that rely on other organisms, especially plants, for nutrients, including carbon, their diversity is linked to overall ecosystem diversity. Fungi have high preservation potential in the fossil record due to their cellular composition, thus can be used to track past environmental and climate change, even when other microfossils are scarce. Here we explore fungal diversity preserved in coal samples from the Mae Moh Basin in Thailand, which were deposited during the Middle Miocene Climate Optimum (MMCO; 15-17 million years ago). We show how diversity changed through time, reflecting climate change associated with the MMCO, a period of past global climate change that is often used as a proxy for modern climate change.

12:15 - 1:15 p.m. **Analyzing Honey In Support Of The KYHTL Launch – Identifying Tiny Pink Dots Is Harder Than You Think**

ℙ–48 ***Tera Kaplon*. Dr. Ingrid Romero, Dr. Jennifer O'Keefe, mentors,*** **Department of Physics, Earth Science and Space Systems Engineering, College of Science**

The Kentucky Honey Testing Laboratory (KYHTL) was launched in Fall 2019 and is supported by an initial grant from the Kentucky Department of Agriculture. Completion of the analyses of initial round-robin honey samples between Morehead State University and Bluegrass Community and Technical College was delayed by the onset of COVID, and are now nearing completion. Remaining, however, were some of the more interesting samples, clearly of unknown origin. Simultaneously, a complete turn-over in melissopalynology student researchers occurred at Morehead State University, and pollen identification skills had to be taught to the next generation before they could tackle the unknown. This poster presents the trials and tribulations encountered by a new analyst during identification of significant numbers of unknown pollen and outlines new guidance for identifying pollen from unknown sources.

12:15 - 1:15 p.m. **Microns Matter Methods In Thin Section Manufacture And Analysis**

ℙ–6

Nathan Sparks*. Dr. Jennifer O'Keefe, mentor, **Department of Physics, Earth Science and Space Systems Engineering, College of Science**

The “Boudreaux Bend Bends” are an enigmatic set of alluvial, fluvial, and lacustrine sediments that are incised by the modern North Fork of Triplett Creek fluvial channel. These beds contain an abundant palynoflora and multiple leaf beds. However, no information exists about their sediment source, and there is much debate about the environments in which the sediments were deposited. Sedimentary petrology and grain-size analysis data will help resolve this debate and provide the information needed about the depositional system prior to publication of the palynology results. Before these analyses could be undertaken, however, the thin section machines needed to be repaired and skill in thin-section polishing developed. This presentation outlines the process making grain-mounts of sediment, resurfacing the thin-section machines’ plattens so that micron-scale wafers of grain-mounts could be cut, cutting thin-section wafers, and the polishing process needed to produce even 30-micron thick thin sections.

12:15 - 1:15 p.m. **Catalogue Of Lichen Species In The Rowan County Sphagnum Swamp, Rowan County, Kentucky**

ℙ–𝟙

DeAnna Kidd*. Dr. Allen Risk, mentor, **Department of Biology and Chemistry, College of Science**

Rowan County Sphagnum Swamp is one of the best remaining examples of a bottomland swamp forest left in the Knobs region of Kentucky. Bottomland swamp forests are characterized by soil with a high percentage of organic matter above clay and Devonian shale. This arrangement leads to standing water much of the year and a strongly acidic soil. Common tree species in the Rowan County Sphagnum Swamp include Acer rubrum (red maple), Quercus palustris (pin oak), Liquidambar styraciflua (sweet gum), Nyssa sylvatica (sour gum) and Betula nigra (river birch). Bottomland swamp forests used to be more common, but have dwindled due to land clearing for timber and agriculture. The research project included cataloging the species of lichens found in the Rowan County Sphagnum Swamp through five field trips to the study site. Eighty-five collections were made with samples being deposited in the Morehead State University Herbarium (MDKY). Lichen samples were identified using dissecting and compound microscopes, C (bleach) and K (KOH) chemical tests, and observation under ultraviolet light. Common species of lichens included Buellia erubescens, Lecanora hybocarpa, Punctelia rudecta, and P. missouriensis. Uncommon species included Lecanora thysanophora. This research was supported by a Morehead State University Undergraduate Research Fellowship.

12:15 - 1:15 p.m. **Factors For Success In Rural Tourism: A Case Study Of Eastern Kentucky**

ℙ−2

Bethany Allen*. Dr. Vijay Subramaniam, mentor, **Department of Agricultural Sciences, College of Science**

Short Abstract:
An investigation of what factors contribute to a successful rural tourism development in Morehead and Eastern Kentucky. Through an assessment of the resources available to Morehead, factors that make a business successful in this area have been found and better understood. A collection of Morehead tourism statistics and as well as a collection of statistics for the state of Kentucky will be used.
Long Abstract:
This research study examines the variables of tourism that influence a traveler's decision when traveling in Eastern Kentucky, specifically Morehead, Kentucky. Morehead is a destination with great potential to be built into a prominent location for tourism in Kentucky. To best understand the potential of the area, the resources available and the existing tourism locations were accessed to build the foundation of this project. Successful tourism destinations around the state of Kentucky have been assessed to determine what factors contribute to their success as well as what tactics/resources the businesses use to draw people in. In comparison to successful tourism destinations in the Lexington, Red River Gorge, Louisville, Bowling Green, and Newport areas, Morehead is lacking in the attractions that draw guests in to stay for longer than one day. Upon further study, Morehead was found to be an ideal location due to the college presence and the natural attractions such as Cave Run Lake and the Daniel Boone National Forrest as well as Morehead's easy access to the interstate. Morehead is lacking in hotel room availability, night life, extended store hours, and access to services such as Uber and Lyft.

12:15 - 1:15 p.m. **Fall And Rise: Changes In The Fish Community Of Triplett Creek Following Restoration Of A Channelized Reach.**

ℙ–3

Austin Spradlin*, Jonathan Eisenhour. Dr. David Eisenhour, mentor, **Department of Biology and Chemistry, College of Science**

In the early 1970s, Triplett Creek in Morehead, Kentucky, was straightened, deepened, and widened, resulting in a rather homogenous aquatic habitat, varying little in depth, flow, and substrate. In summer of 2018, a section of the stream was "restored" in order to alleviate the bank instability and flooding problems created by the 1970s channelization, restore the health of its aquatic community, and improve recreational opportunities. Our goal was to examine changes in the fish population resulting from the extensive changes to the channel and substrate during the restoration. We studied the fish populations at four sites (two sites in the restored area and two unaltered reference sites) in June of 2018, just before the restoration work occurred, and then four times after the work occurred, in October 2018, June 2019, October 2019, and October 2020. Fishes were qualitatively sampled using backpack electrofishing and seining. Encountered fishes were identified and counted, which allowed us to assess the fish community health using the Kentucky Index of Biotic Integrity (KIBI). In June 2018, prior to any restoration work, the four sites had KIBI scores between 59 and 70, all of which rated as "good". The two sites in the restored area had a higher proportion of nonnative species, and fewer darters compared to the reference sites. In October 2018 and June 2019, after the restoration work, the restored sites declined slightly in KIBI scores, had reduced number of species detected, especially species considered "intolerant" by KIBI, and had reduced number of darter species, while the control sites showed little change. However, in October 2019 and October 2020, KIBI metrics had greatly improved in the restored sites, becoming similar to, or surpassing, KIBI metrics in the reference sites. However, the restored sites still have considerably more nonnative species than do the reference sites, perhaps because riparian vegetation and large woody debris has yet to be established in the restored sites.

12:15 - 1:15 p.m. **Identification Of Kentucky Land Snail Species**

P–5

Tessa Whalen*. Dr. Allen Risk, mentor, **Department of Biology and Chemistry, College of Science**

Land snails are members of the Phylum Mollusca and the Class Gastropoda. The importance of land snails to their native ecosystems has been greatly underestimated and understudied. For example, land snails play a huge role in the cycling of micronutrients in their ecosystems, they are active in the dispersal of plant seeds and fungal spores, and they have been shown to be bioindicators for vertebrates of conservation concern. They also contribute to the ecosystem by leaving their shells behind when they die, which is then used as a source of calcium carbonate by many species, and used in the formation of limestone. There are approximately 194 native species of snails in Kentucky, not including the 10 introduced species. The purpose of this investigation was to learn the morphology of land snail shells in order to improve identification skills. Important features used to identify land snails include the shell shape, the diameter of the shell, the reflection of the aperture lip, the umbilicus, the teeth associated with the aperture, and the number of whorls. Several local genera such as Punctum, Discus, and Haplotrema have a distinctly wide umbilicus, while genera such as Glyphyalinia, Stenotrema, and Mesodon are considered perforate to imperforate, or without an open umbilicus. The genera Triodopsis, Euchemotrema, Inflectarius, and Xolotrema all have large teeth in the aperture that can be used to identify the species based on the size and position of the teeth. This research was supported by a Morehead State University Undergraduate Research Fellowship.