Jan 10th, 12:00 AM

09. Environmental Science

University of Central Oklahoma

Abstracts from the 2013 Oklahoma Research Day

Held at the University of Central Oklahoma

05. Mathematics and Science

09. Environmental Science

05.09.01 Effects of Climate Change on Biomass Allocation to Leaves and Specific Leaf Area Along an Elevation Gradient

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Tropical forests are globally important for biodiversity and ecosystem functions that affect global climate via carbon and water balances. However, we lack experimental understanding of how climate change will affect tropical forests. I studied two common tropical rainforest tree species in 17 common garden plots along an elevational gradient (6 high, 6 mid, 5 low; at 1350m, 1050m and 650m respectively), where conspecific individuals were planted downslope to mimic future changes in climate at the native elevation. I quantified leaf biomass by counting the number of leaves in each tree and taking leaf samples to determine individual leaf mass. Our results suggest that biomass allocation to leaves sensitive to climate change is species and population specific. Also, specific leaf area is affected by climate change differently across species, and for some species is related to both environmental and genotypic factors. As leaves are directly related to tree development and productivity, and also closely linked with primary production and consequently, carbon sequestration, this study helps shed important insight into how individuals within and across species respond to climate change in that specific leaf area will change, but leaf biomass is not affected.

05.09.02 Investigation of Indigenous Actinomycetes as Chlordane Remediation Agents

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Actinomycetes bacteria are promising remediation agents capable of dechlorination and degradation of many organochlorine pesticide contaminants. In this study, Actinomycetes strains were isolated from soil samples collected from a chlordane-contaminated site. Fifty-four strains were identified by morphological and biochemical characteristics referenced in Bergey's Manual. A tolerance assay was conducted to identify strains exhibiting normal growth in the presence of high concentrations of the toxic chlordane compound. Twelve actinomycetes strains were identified as tolerant, candidate remediation agents. The candidate strains were subjected to a mixture of a-chlordane and g-chlordane in solution to evaluate the strains' capacity to degrade the isomeric compounds either as a sole carbon source or by co-metabolism with lignin as the primary carbon source. Metabolic residues are currently being analyzed by gas chromatography mass spectrometry to determine the extent of chlordane degradation and the identity of the metabolic degradation products. The goal of the research is to provide needed information toward a cost-effective remedial approach to persistent contaminants in the environment.

05.09.03 Paleontological Survey of Ordovician West Spring Creek Formation, Arbuckle Group, Kiowa County, OK

Brian Campbell, Zella Classen,

Southwestern Oklahoma State University

Oklahoma has a varied geological and paleontological history. There is still much to learn from the geologic exposures in this state. Numerous studies have been done with Mesozoic and Cenozoic paleontology and sedimentary geology, but many Paleozoic exposures have only cursory published studies, with most of these exposures having not been revisited for decades. We initiated a general paleobiological survey of the West Spring Creek formation (Ows), Arbuckle Group from the Ordovician Period, early Paleozoic Era. These exposures are dating from 443.7 – 488.3 Ma (+/- 1.5) and have little or no published research. This study employed a SWOSU student with an interest in invertebrate paleontology to assist with the cleaning of samples and identification of fauna. Several unpublished organisms and undescribed features from the Ows formation were identified. Identified organisms include: crinoids, brachiopods, gastropods, straight and coiled cephalopods. Identified mineral features include: pyrite crystals, limey sandstone, and chert nodules. We had anticipated finding pelecypods; unfortunately none were to be identified.

05.09.04 Statistical Count of Invertebrata from Ordovician West Spring Creek Formation, Arbuckle Group, Kiowa County, OK

Brian Campbell, Zella Classen,

Southwestern Oklahoma State University

Several Ordovician (early Paleozoic) exposures dating from 443.7 – 488.3 Ma (+/- 1.5) with little or no published research were identified south of Mountain View, Oklahoma on hiway 115. This study surveyed the West Spring Creek formation (Ows) of the Arbuckle Group and performed an invertebrate identification and count, and environment interpretation. Twenty rock samples from this exposure were cleaned, cut, and analyzed for invertebrate fossils. Organisms including: brachiopods, cephalopods, foraminifera, gastropods, and crinoids were identified. Finding crinoid ossicles in the abundance we did was surprising, as little reference to them has been documented in the Ows. Trace fossils in the form of borrows, though uncommon, were identified in a few samples. Also surprising was the discovery of small pyrite crystals, fine limey sandstone, and chert nodules. Of the identified fossils, brachiopods and gastropods were the most common. From the fossils and matrix, we concluded the Ows was a shallow, warm marine environment, relatively high energy, with a limey mud substrate. Life was common, but not abundant. Many fossils found in the rocks likely lived in the area, but not the exact location they were found as signs of transport were evident. There were some indications of predation. In short, a limited, yet complex shallow photic marine ecosystem is indicated having existed between 444 and 488 Million years ago, just south of present day Mountain View, Oklahoma.

05.09.05 Understanding the Keystone XL Pipe Line: It's impact on the Environment and Economy

Mathew Baldwin, Dr. A.K. Fazlur Rahman,

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The Keystone XL Pipeline project is currently seeking a presidential building permit and if passed will begin in construction in early 2013 and be completed in 2014-2015. The proposed route is 3,456 Km running from Hardesty, Alberta to Port Arthur, Texas. This pipeline is important to Oklahoma as it runs through Oklahoma with a major distribution point at Cushing, Oklahoma. The cost for building the US portion of the pipeline is 7 billion. Part of this will go to the state of Oklahoma as Oklahoma will house 9 of 39 pumping stations as well as the distribution point at Cushing. Economically this will provide approximately 4,800 to 7,000 temporary construction jobs and an estimated 2,000 permanent jobs across the 39 pumping stations. The pipeline will transport bitumen which is a highly viscous hydrocarbon commonly called Asphalt. There are 3 major methods of extracting the bitumen Cold Flow, Steam assist gravity drainage, Toe to heel Air Injection. Tar sands on average release 12% higher CO_2 emission. Another environmental problem with the pipeline is its route through the middle of the Ogallala Aquifer in Nebraska. This poses serious problems as it will contaminate a water source that supplies 30% of US farmland. In summary, this presentation will discuss the extraction process and its impact on the environment.

05.09.06 Effects of Mango Supplementation on Clinical Parameters of Obese Individuals

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We have previously shown that mango (Mangifera indica L.) reduced body fat and improved blood glucose in mice fed high fat diet. The objective of this pilot study was to examine the effects of supplementation of freeze-dried mango on body composition and clinical parameters in obese adults. Twenty adults (11 males and 9 females) with body mass index (BMI) of 30-45 kg/m2 participated in the study and were given 10 grams of freeze-dried mango daily for 12 weeks. Body composition by dual energy x-ray absorptiometry, anthropometric, and clinical parameters were measured at baseline and at the end of supplementation. There were no significant changes in body weight and composition in both genders after mango supplementation. However, BMI is significantly increased in female subjects but not male participants compared to baseline. Hip circumference is lower in male subjects but not female participants with mango supplementation. Similar to our animal findings, mango significantly reduced blood glucose concentrations in both male and female subjects. Our findings indicate that regular consumption of mango by obese individuals does not negatively impact their body weight but provides a positive effect on their blood glucose.

05.09.07 The Effects of Perceived Mental Fatigue on Exam Scores

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Southeastern Oklahoma State University

The objective of this research was to examine the effect of perceived fatigue levels on students' exam scores. It was predicted students that were mentally fatigued would score lower on exams than students who were well rested on exam day. It was anticipated that confiding variables such as; student employment; hours per week; student athlete; age range of student; children in the household; and hours the student studied for the exam; would play a role in the results. Using information from previous studies the team developed a survey to collect data relevant to the exam scores and fatigue. The data was collected from the students in a relevant course (Ergonomics). There were approximately 160 students/exams surveyed. The data was coded and entered into a database using a SPSS to conduct a digression analysis.There is now additional data being collected.