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THE RELATIONSHIPS BETWEEN LANGUAGE USE AND BRAINSTORMING PERFORMANCE AMONG DISTRIBUTED AND FACE-TO-FACE GROUPS. **Jennifer Batka, Emily Beadles, and Mary Dzindolet.** Cameron University, Department of Psychology, 2800 Gore Blvd., Lawton, OK 73505.

Pennebaker (2001, Adv. Mind-Body Med 17: 160) and his colleagues have found that the language one chooses to use in conversation (and solitary writing) is related to several factors. Extending this work to group dynamics, Purcell and Dzindolet (2001, poster, Res Day Okla Reg Univ, Univ Cent Okla) found the more ad-hoc group members used the first person singular pronouns (I, me, my), the fewer the number of ideas they generated on a brainstorming task. The purpose of this study was to determine the extent to which communication medium affects the relationship between language use and group brainstorming performance. One-hundred and fifty-six Cameron University students brainstormed ten minutes in face-to-face groups of size two or four or in distributed groups of four. Results indicated that the more face-to-face groups used the present tense the more productive they were, r-dyad = -.44, $p < .05$, r-four = -.51; such a relationship did not exist for distributed groups, r-distributed = -.19, $p > .05$. Implications for future research are discussed.

THE EFFECTS OF COMMUNICATION MEDIUM ON THE RELATIONSHIP BETWEEN LINGUISTIC STYLE AND PERFORMANCE ON A MIXED-MOTIVE TASK. **Cassandra Brenner, Victor Wong, and Mary Dzindolet.** Cameron University, Department of Psychology, 2800 Gore Blvd., Lawton, OK 73505.

This study examines the relationship among communication medium, linguistic style, and cooperation among group members. Fifty-one Cameron University students participated in this study (30 females; 21 males; mean age = 26.78 years). Participants performed a prisoner's dilemma task in one of two conditions; computer-distributed or face-to-face. A MANOVA found face-to-face and distributed groups differed in their usage of words for several LIWC variables including second-person pronouns, affect words, and social words. A correlational analysis found several relationships between group performance and linguistic style. The more computer-distributed groups used the future tense, the more cooperative choices they made, but the more face-to-face group used the future tense, the fewer cooperative choices they made. Implications for future research are discussed.

AN EXPLORATORY ANALYSIS OF THE VARIANCE IN SPECIES COMPOSITION OF A TALLGRASS PRAIRIE EXPLAINED BY SOIL PHOSPHORUS FRACTIONATION. **Joshua** M. **Brokaw and** Michael W. **Palmer.** 104 Life Sciences East, Department of Botany, Oklahoma State University, Stillwater, OK 74078

We estimated percent cover of plant species in 2010m x 10m grassland plots at the Tallgrass Prairie Preserve in Osage County, Oklahoma. For each plot we gathered soils and analyzed them for major nutrients and soil properties. In this analysis I used Canonical Correspondence Analysis to determine whether soil phosphorus fractions (Resin Pi, Bicarb Pi, Bicarb Po, NaOH Pi, NaOH Po, 1.0 M HCL Pi, Concentrated HC1 Pi, Concentrated HC1 Po, and Residual P) explain composition of tallgrass prairie species beyond that explained

by the other environmental variables measured. Through forward selection I chose four environmental variables (Organic C, pH, Fe, and Residual P) that explained a significant portion of species variation (± = .05). Using variance partitioning I found that 35% of the variation was explained by the four variables, and 6% of the variation was explained only by the Residual P fraction of soil phosphorus.

STATUS OF SOIL NUTRIENTS FOLLOWING BIOREMEDIATION OF PETROLEUM CONTAMINATED TALLGRASS PRAIRIE SOILS. **Joshua Brokaw.** 104 Life Sciences East, Department of Botany, Oklahoma State University, Stillwater, OK 74078

In January 1999 a pipeline break releasing dewatered crude oil contaminated two areas separated by about 100 m at the Tallgrass Prairie Preserve in Osage County, Oklahoma. In May 1999 prairie hay was applied to both areas by tilling. Both areas were divided with corrugated plastic sheeting, and the down slope sections of each area were fertilized with NH_4NO_3, P_2O_5, and K_20. One control section of uncontaminated prairie also was tilled with prairie hay. In this study I analyzed soils collected during June 2003 to determine whether significant differences in nitrogen and phosphorus pools persisted in the contaminated sites due to fertilizing and tilling. I collected soil samples from 40 grassland sites within the preserve to provide a replicated control. I found that fertilized soils of the bioremediated sites exhibit levels of plant-available inorganic nitrogen and phosphorus in excess of the highest levels measured in the replicated control soils.

GASTROINTESTINAL HELMINTHS OF RAFINESQUE'S BIG-EARED BAT, CORYNORHINUS RAFINESQUII (CHIROPTERA: VESPERTILIONIDAE), FROM SOUTHWESTERN ARKANSAS. **Angela** D. **Burns**[1], Chris T. McAllister[1], and Charles R. **Bursey**[2.1]Department of Biology, Texas A&M University-Texarkana, Texarkana, TX 75505; [2] Department of Biology, Pennsylvania State University-Shenango Valley Campus, Sharon, PA 16146.

Rafinesque's big-eared bat, *Corynorhinus rafinesquii* (Lesson, 1827), a former USFWS Category 2 species and currently a species of concern in Arkansas, is a medium-sized bat with very prominent ears and a large, distinctive facial gland on each side of its snout. The species inhabits hollow trees, crevices, culverts, and a variety of abandoned buildings. Although information is available on the ectoparasites of C. *rafinesquii,* little has been published on its helminth parasites. On 3 July 2003, 10 juvenile and adult C. *rafinesquii* were collected from a church belfry at Billingleys Corner off state highway 41, Little River County, Arkansas, and returned to the laboratory for necropsy. The following parasites were found to infect these bats: an immature tapeworm, *Vampirolepis* sp. in one (10%), and the nematodes, *Physaloptera* sp. (third-stage larvae) in one (10%) and female *Capillaria palmata* Chandler, 1938, in nine (90%). These represent new host records and *C. palmata is* reported from Arkansas for the first time. In addition, no coccidial parasites were observed in fecal samples and blood was negative for hematozoans.

NEW GEOGRAPHIC DISTRIBUTION RECORD FOR *THEATOPS POSTICUS* (CHILOPODA: SCOLOPENDROMORPHA: CRYPTOPIDAE), FROM NORTHWESTERN OKLAHOMA. **Michelle** L. **Cameron**[1], Chris T. McAllister[1], **and Rowland** M. Shelley [2.1]Department of Biology, Texas A&M University-Texarkana, Texarkana, TX 75505; [2]North Carolina State Museum of Natural Sciences, 4301 Reedy Creek Road, Raleigh, NC 27607.

Shelley (2002.Virginia Mus Nat Hist Mem No 5:1-108) provided a synopsis of the North American centipedes of the order Scolopendromorpha that included three families, eight genera, and 21 species. One of these species, *Theatops posticus* (Say, 1821), was reported to consist of two allopatric populations, an eastern one that extends westward from Arkansas to the eastern one-third of Oklahoma at an unknown locality in Seminole County. This centipede has also been reported from Pittsburg, Choctaw, Marshall, and McCurtain counties in the east-central, extreme south-central, and southeastern part of the state, respectively. A recent trip to northwestern Oklahoma provided an additional specimen of *T. posticus* from the state, collected under a rock at the entrance to Owl Cave, 9.6 km south of Freedom off state highway 50A, Alabaster Caverns State Park, Woodward County. Habitat consisted of rock and mineral formations in ravines and gorges of mixed-grass prairie predominated by cedar elm, eastern red cedar, and live oak. This site is more than 175 miles northwest of Seminole County and represents the westernmost record of an indigenous east-Nearctic scolopendromorph species in the family Cryptopidae. Additional collecting in other western Oklahoma counties may provide further records for scolopendromorph centipedes, and a more extensive range than previously known for T. *posticus* in the state.

RELIANCE ON AN IMPERFECT AUTOMATED DECISION AID. Paul Clark, Jan Shields[1], Mary Dzindolet[1], and Hall Beck[2] [1]Cameron University, Department of Psychology, 2800 Gore Blvd., Lawton, OK 73505; [2]Appalachian State University, Department of Psychology, Boone, NC.

Several combat identification systems have been designed to reduce fratricide by providing soldiers the ability to "interrogate" a potential target by sending a signal that, if returned, identifies the target as a "friend." Ideally soldiers will appropriately rely on these automated decision aids. However, research has found human operators often under-utilize (disuse) or overly rely on (misuse) automated systems (cf. Parasuraman & Riley, 1997, Hum Fact 39: 230). Batka, Beadles, & Dzindolet (2003, poster, Llano Est Undergr Psych Res Conf, Texas Tech Univ) found students inappropriately ignored a perfect automated aid. The participants were unable to adjust their reliance strategy to the reliability of the automated aid. Perhaps this was due to a bias toward self-reliance. The purpose of this study was to determine the reliance strategy of participants paired with an aid that was always incorrect in a dichotomous decision. Thirteen Cameron University students followed the incorrect aid into errors on 9.39% of the trials. Thus, even when participants knew that their automated decision aid was always wrong, their reliance strategy was imperfect.

THE EFFECT OF ASIAN CLAM (*CORBICULA FLUMINEA*) DIE-OFFS ON NATIVE UNIONID MUSSELS. Naomi A. **Cooper and Joseph** R. **Bidwell.** Department of Zoology, Oklahoma State University, Stillwater, OK 74078

The object of this study was to evaluate the extent to which water quality impacts from die-offs of the Asian clam *(Corbicula fluminea)* could pose a risk to infaunal organisms such as juvenile unionid mussels. A series of laboratory experiments were conducted to characterize levels of total and unionized ammonia produced in sediment pore and overlying waters as clam tissues decayed. Test chambers containing a gravel substrate or sediment from the Little Black River, Missouri, were prepared by placing varying numbers of dead clams in the substrate and monitoring ammonia, dissolved oxygen levels and pH for 4 to 10 days. Sediment pore waters consistently had higher ammonia concentrations than overlying water, with levels of ammonia positively correlated with temperature and density of clams involved in the die-off. Unionized ammonia concentrations in pore water ranged from 0.022 to 1.05

mg N-NH_3/L across all experiments, with many values similar to or exceeding levels reported to be acutely toxic to some species of unionid. While water flow reduced concentrations of ammonia in overlying water, the effects on porewater was dependent on sediment grain size (larger grain size, greater removal of ammonia). In 10-day tests, the ammonia levels often continued to increase through day 7, indicating that the capacity for juvenile mussels to avoid toxicity through behavioral avoidance may be exceeded. Overall, the results indicate that ammonia production associated with Asian clam die-offs could pose a risk to unionid mussels, particularly during warm, low-flow summer months.

DEVELOPING INDICES OF BIOLOGICAL INTEGRITY FOR WETLANDS IN CENTRAL OKLAHOMA. Dena Hartzell, Joseph Bidwell, and Craig Davis. Department of Zoology, Oklahoma State University, 430 Life Sciences West, Stillwater, OK 74078

Indices of biological integrity (IBI) have been proposed for use in evaluating the quality of wetland habitats. The IBI is the sum of multiple metrics scores, and is established by evaluating an assemblage of organisms from sites that occur across a gradient of human disturbances. A metric is defined by the US Environmental Protection Agency as some measurable component of an assemblage that shows a significant change across a gradient of human disturbance. While the IBI approach has been used to evaluate wetlands in the northern United States, little work has occurred in applying the IBI approach to wetlands in Oklahoma. The present study seeks to use macroinvertebrates, vegetation, and bird communities to develop an IBI for wetlands in central Oklahoma. Steps in developing an IBI include: classifying wetlands, establishing a gradient of human disturbance among the wetlands, sampling assemblages within a wetland, evaluating attributes and metrics of the assemblages, scoring the metrics, calculating the IBI score, and interpreting the data. Currently, more than thirty wetlands have been described as candidate sites across central and northern Oklahoma. Soil surveys, aerial photos, and topographic maps are being used to define true wetlands and to establish a working group of 12-15 sites. Some issues that must be dealt with during the preliminary phase of the study are finding and gaining access to potential sites from private landowners, lack of water in a number of candidate wetlands during the summer/fall, and finding wetlands across a range of human disturbance. During two years, wetlands will ideally be sampled seasonally to determine temporal differences in IBI scores and assemblages.

EFFECTS OF RELATIVE REFRACTIVE INDEX ON OPTICAL TRAPPING. Cassandra Hoyt. Dept. of Physics and Engineering, 100 N. University Drive, University of Central Oklahoma, Edmond, OK 73034

Optimization of trapping efficiencies is necessary in order to increase the novel uses of laser tweezers. This presentation reports work toward optimizing efficiencies in an optical tweezers setup by varying the relative refractive index of samples. We discuss limitations caused by available trapping media. By trapping various particles in liquids, we discovered that choosing optimum materials requires consideration of many factors other than the refractive indices of particles and liquids.

SPECIES LIST AND HABITAT ASSOCIATIONS OF SNAKES AT THE J.T. NICKEL PRESERVE IN NORTHEASTERN OKLAHOMA. **Robert** C. Jadin **and** Erik Terdal. Department of Biology, Northeastern State University, Tahlequah, OK *74464*

Northeastern Oklahoma has diverse potential habitats for snakes, but much of the region has not been studied by herpetologists. In this study, we identified the snake species in The

Nature Conservancy's new J.T. Nickels Preserve in Cherokee County. We also investigated the association of each species with the diverse habitats in the approximately 15,000 acre preserve. Data was collected using a variety of methods in the Spring of 2003: cover boards, tin sheets, flipping rocks, roadside searching, walking transects, and interviews with preserve staff. We identified 15 species, including Western Worm Snake, Prairie Ringneck Snake, Eastern Yellow-bellied Racer, Speckled Kingsnake, Red Milksnake, Texas Brown Snake, Rough Earth Snake, Western Ribbon Snake, Eastern Garter Snake, Northern/Midland Water Snake, Timber Rattlesnake, Osage Copperhead and Cottonmouth. Wooded hillsides, and ponds in woods, were the most species rich habitats. Open fields (pastures), and ponds in these areas, were low in species richness. We also found more species and individuals in roadless areas. We suggest that for the conservation of snakes, roadless areas in woodlands should be preserved.

PLANT DIVERSITY ON CONTRASTING SOIL TYPES IN TEXAS COUNTY, OKLAHOMA. Katy Levings[1], **Wayne Elisens[2], Bruce Hoagland[3].** [1]Deparmment of Botany/ Microbiology, [2]Department of Botany/Microbiology and Biological Survey, [3]Department of Geography and Biological Survey, University of Oklahoma, Norman, OK 73019.

Studies concerning botanical and ecological conditions in Texas County have been few compared to the rest of the state and the Black Mesa region of neighboring Cimarron County. To document plant diversity in representative habitats of Texas County, I initiated a study to inventory plant communities on two sites with differing soil types and to investigate the effect of abiotic and biotic factors on plant diversity. The two sites chosen are a minimally grazed and privately owned pasture at 3100' elevation in the north and the Angler's Point recreation area at 2700' elevation in Optima State Park in the south. The sandy loam soils of the pasture represent typical farm land where the water table is at least 280 ft below ground. The river bottom with the water table at ground level has caliche lined silty soils and caliche hills, which are typical of ranch land. Ecological, geological, and hydrological investigations of the study sites indicate that the pasture contains typical shortgrass vegetation; the dominant grasses are blue and black grama and buffalo grass. At Angler's Point, mixed grass communities with little bluestem and sideoats grama occur adjacent to riparian vegetation characterized by salt cedar and eastern red cedar. A number of rare species is found there, one of which is black grama, which does not occur east of the county. Increasing pressures on Texas County's natural ecosystems from overgrazing, water diversion, and large commercial hog farming necessitate investigations of plant diversity to provide a baseline to monitor ecological change.

DIFFERENCES IN ENVIRONMENTAL CONDITIONS UNDERNEATH *JUNIPERUS VIRGINIANA* TREES IN CENTRAL OKLAHOMA. **Jerad S. Linneman.** Department of Botany, Oklahoma State University, Stillwater, OK 74078

I conducted a study to assess how environmental conditions differ underneath eastern red cedar *(Juniperus virginiana)* trees, as compared to the surrounding area. I found soil temperatures to be 20-30°C lower within the canopy radius as compared to open prairie. In addition, incoming solar radiation under the canopy was only 5%-10% of the unobstructed open prairie. Total precipitation was 50%-75% lower underneath the tree; however, precipitation underneath the tree was spatially and temporally variable. Increased temporal variability of micro-climatic conditions on the north side of trees indicates the possibility of a tree shadow effect. Conversely, I found no significant trends in soil acidity underneath red cedar trees as compared to open prairie. I also found deep litter layers on the soil

surface and large accumulations of litter in litter traps underneath red cedar trees as compared to the relatively thin litter layers and minimal accumulations in the surrounding prairie. Cedar litter decay was only 15%-20% of the total weight over the two years of the study. Difference in environmental conditions and litter influences may potentially have a dramatic affect on specie composition under red cedar trees.

FIELD RESEARCH EXPERIENCES IMPROVE SECONDARY SCIENCE TEACHER ATTITUDES TOWARD SCIENCE INQUIRY. Brad Ludrick, Doug Wood and Angie Munholland. Biology Department, Southeastern Oklahoma State University, 1404 N. 4 th Ave., PMB 4014, Durant, OK 74701-0609

The objectives of this study are to provide a constructivist approach to professionally develop and measurably improve scientific reasoning and inquiry skills of secondary science teachers as scientists through active participation in scientific research, thus translating into improved secondary science student performance. This study will recruit approximately 36 eighth grade science and high school biology teachers from rural school districts in southeastern Oklahoma. Teachers participating in the treatment group will participate in a summer field research experience workshop. In addition to research training and experiences, the workshop will provide each participant permanent research equipment and supplies, follow-up mentoring and assistance from college faculty, graduate credit, and learned society membership. The results of the study indicate that exposure to field research and access to higher education faculty significantly improve the secondary science teacher's attitudes toward science inquiry and their desire to incorporate science inquiry into the secondary science classroom.

INTERACTIONS OF AN *ARABIDOPSIS* TETRATRICOPEPTIDE REPEAT-CONTAINING PROTEIN KINASE. Rebecca S. May and Terry R. Conley. Department of Biology,Oklahoma City University,Oklahoma City, OK 73106

The *Arabidopsis* gene At3g54030 encodes a receptor-like cytoplasmic kinase (PPC:1.16.1). This protein is predicted to contain a single N-terminal tetratricopeptide repeat domain, four N-myristoylation sites, and a eukaryotic protein kinase catalytic domain. A full-length cDNA was subcloned in frame into the pBD-Gal4Cam vector (Stratagene). The resulting construct expresses a yeast Ga14 DNA binding domain-TPR protein kinase fusion protein This plasmid was used as the bait in yeast two-hybrid screens of three *Arabidopsis* cDNA libraries. Positive clones were identified from libraries of etiolated seedling and floral cDNAs. Preliminary characterization of these positive clones will be presented.

HELMINTH PARASITES OF THE GROTTO SALAMANDER, TYPHLOTRITON SPELAEUS (CAUDATA: PLETHODONTIDAE), FROM NORTHERN ARKANSAS AND SOUTHERN MISSOURI. Chris T. McAllister[1], **Charles** R. **Bursey** [2], **and Stanley E. Trauth** [3] [1]Department of Biology, Texas A&M University-Texarkana, Texarkana, TX 75505; [2]Department of Biology, Pennsylvania State University-Shenango Valley Campus, Sharon, PA 16146; and [3]Department of Biological Sciences, Arkansas State University, State University, AR 72467.

The grotto salamander, *Typhlotriton spelaeus* Stejneger, 1893 is a troglobitic species that resides in Ozark Plateau caves from southwestern Missouri to extreme northeastern Kansas and adjacent areas of northern Arkansas and northeastern Oklahoma. Larval T. *spelaeus* inhabit mountain brooks, springs, and cave entrances, whereas the blind adult is typically found in the twilight and dark zones of wet caves, underground streams, and sinkholes. Little is known

about the helminth parasites of this enigmatic salamander. Thirty-eight larval and adult T. *spelaeus,* were borrowed from the Arkansas State University Museum Herpetological (ASUMZ) collection and examined for helminth parasites. These salamanders had been collected in 1936, 1967-68, 1973-74, 1976, and 1988 from various locales in Independence, Izard, Sharp, and Stone counties, Arkansas, and Boone, Howell, and Taney counties, Missouri. In addition, eight larval *T. spelaeus* were more recently collected (March 2003) from two caves in Shannon County, Missouri. Seven (18%) of the ASUMZ salamanders harbored infections, including one (2.6%) with the trematode, *Plagioporus gyrinophili* Catalano and Etges, 1981, two (5.3%) with the cestode, *Bothriocephalus typhlotritonis* Reeves, 1949, five (13.2%) with the nematode, *Amphiocapillaria tritonispunctati* (Walton, 1935) Moravec, 1982, and one (2.6%) with the acanthocephalan, *Fessisentis vancleavei* (Hughes and Moore, 1943) Nickol, 1972. In addition, all eight (100%) larval *T. spelaeus* from Shannon County, Missouri, harbored a neascus type metacercariae of a strigeoid trematode in their gills and body tissues. *Plagioporus gyrinophili* and F. *vancleavei* represent new helminth records for this host; new geographic distributional records are recorded for *P. gyrinophili* and *B. typhlotritonis.*

LYCOPENE EXTRACTION FROM FREEZE-DRIED TOMATOES. D. Morningstar[1], P. Perkins-Veazie[2], and S. Rice[1]. [1]Southeastern Oklahoma State University, Durant, OK 74701; [2]South-Central Agricultural Research Laboratory, Agricultural Research Service, Lane, OK 74555

Lycopene, a carotenoid pigment with powerful antioxidant properties imparts the red color to tomatoes, watermelon, and red grapefruit. Tomatoes provide much of the dietary lycopene in the western world, primarily in processed forms such as ketchup, tomato sauce, and juice. Lycopene for dietary supplements is extracted from cannery waste (mostly tomato skins, the primary location of lycopene in tomato fruit). Solar or freeze-drying is done to reduce water and facilitate extraction by non-organic solvents such as CO2. Watermelons, which contain lycopene in the internal red flexh, lose 50% of total lycopene after freeze-drying. Lycopene in watermelons may be protected by the high soluble solids content (12% fresh weight), or alternatively, increased hygroscopicity may promote lycopene extraction. Tomatoes from a standard variety ('Homestead') and a high pigment type ('T5020') were harvested at breaker (about 10% red) and fully ripe stages. Equatorial slices were removed from fruit and held at -20 C. One quarter of each slice was lyophilized and one quarter of the same slice homogenized. The total soluble solids content of the spectrophotometric absorption was measured at 503 nm. Lycopene loss in freeze-dried tomatoes ranged from 20-40%. Therefore, selection of high lycopene content tomatoes for extraction is important for economic recovery of lycopene.

WHY IS THE SEASIDE ALDER RARE?: SHADE TOLERANCE IN *ALNUS MARITIMA* AND *ALNUS SERRULATA*. Morningstar, Dawn[1], Stanley A. Rice[1], **James** A. **Schrader[2],** William Graves[2], **and** J. Phil Gibson[3]. [1]Southeastern Oklahoma State University, Durant, OK; [2]Iowa State University, Ames, IA; [3]Agnes Scott College, Decatur, GA.

Alnus maritima consists of three subspecies, all of them rare; one is the Oklahoma seaside alder (ssp. *oklahomensis).* In contrast, *Alnus serrulata* (the hazel alder) is abundant throughout eastern North America. Both species of alders regenerate mainly by sprouting from clumps. Seedlings of both alders, however, require bright sunlight. Our field measures indicate that seaside alder clumps grow mostly in bright sun, while hazel alder clumps can grow in shade as well. Hazel alder leaves in the shade produce more chlorophyll than seaside alder leaves in the shade, which indicates that hazel alders have much greater shade tolerance than seaside alders. Hazel alder is abundant, and seaside alder rare, because hazel alder clumps persist in the shade better than do seaside alder clumps.

VERBAL COMMAND AND CONTROL OF CRT MAP DISPLAYS. Gregory A. **Plumb.** Department of Cartography & Geography, East Central University, Ada, OK 74820-6899.

Computer-based vehicle navigation systems (VNS) normally display map information based upon two forms of interaction. The first is an automated, updated centering of the map based upon geographic coordinates received from a global positioning system (GPS) receiver mounted in the vehicle. The second is user-specified, where a mouse or keyboard is used to change map scale (zooming in or out), pan the map a given direction, or invoke other map-related commands. If the driver is the only person in the vehicle, the user mode is not only awkward, but is also unsafe due to significant hand-eye coordination required to interact with the VNS. An alternative, less distracting form of interaction would be the ability of the VNS to respond to verbal commands. This presentation demonstrates the use of voice recognition software for user-interaction with a VNS. Simple commands will be shown for changing map scale and panning a selected direction. Methodology will also be provided on how to achieve an interface between these two technologies.

PRELIMINARY RESULTS OF THE 2003 OUACHITA MOUNTAINS BAT BLITZ, WEST CENTRAL ARKANSAS. **Zachary** D. **Ramsey**[1], Chris T. McAllister[1], D. **Blake Sasse**[2] **and David** A. **Saugey**[3].[1]Department of Biology, Texas A&M University-Texarkana, Texarkana, TX 75505; [2]Arkansas Game and Fish Commission, #2 Natural Resources Drive, Little Rock, AR 72205; [3]U.S Forest Service, P.O. Box 189, Jessieville, AR 71949.

The 2003 Ouachita Mountains Bat Blitz took place from August 4-7, 2003, in the Ouachita National Forest of the Interior Highlands of western Arkansas. The purposes of the blitz was to learn more about the biology of bats in the region while sharing collecting and sampling techniques with other researchers. The event was co-sponsored by the U.S. Forest Service, Arkansas Game and Fish Commission, and the Southeastern Bat Diversity Network. Camp Clearfork campground, west of Hot Springs in Garland County, served as headquarters. Volunteer biologists from state and federal agencies, universities, and private companies representing nine states collaborated in the research efforts. A total of 209 vespertilionid bats, including 156 eastern red bats, *Lasiurus borealis* (Mailer, 1776), 25 eastern pipistrelles, *Pipistrellus subflavus* (F. Cuvier, 1832), 16 evening bats, *Nycticeius humeralis* (Rafinesque, 1818), seven northern long-eared bats *Myotis septentrionalis* (Trouessart, 1897), and five big brown bats, *Eptesicus fuscus* (Palisot de Beavois, 1796) were captured at 22 sites on streams and roads in four Ranger Districts. Samples from captured bats, including blood, DNA (from wing punches), feces, and hair were collected to aid in ongoing research projects. In order to generate positive publicity for bats, one evening was designated as "media night" and representatives from Arkansas' statewide newspaper along with seven television stations from Arkansas, Oklahoma, and Tennessee accompanied biologists into the field to film trapping sessions and disseminate this information to the public. An excellent story was subsequently published in the Arkansas Democrat-Gazette newspaper (11 August 2003 issue). Due to the success of this event, a third Bat Blitz is planned for the near future.

INFLUENCE OF A FISH INTRODUCTION ON THE SEX RATIO AND SIZE OF DAMSELFLY LARVAE OF THE ENALLAGMA COMPLEX. Nick L. **Rasmussen and Joseph** R. Bidwell. Department of Zoology, Oklahoma State University, Stillwater, OK 74078.

Ponds and wetlands are often stocked with fish as a way to improve their perceived recreational value. The influence of such stocking on resident invertebrates in these systems has not been extensively investigated, although fish predation could significantly change

community structure. A previous laboratory study that examined the effects of sex on the behavior of larvae of a damselfly *(Ischnura verticalis)* indicated that male larvae spent more time moving and moved greater distances than did females which could result in differential susceptibility to capture. This could have serious implications for damselfly populations subjected to predation by introduced fish, since skewed sex ratios could severely impact population viability. The purpose of this study was to determine if damselfly larvae belonging to the *EnalIagma* complex exhibit differential susceptibility to fish predation between males and females. Damselfly exuviae were sampled approximately every 48 h from mid-May to mid-September from a quarter-acre pond both before and after the addition of green sunfish *(Lepomis cyanellus).* A second quarter-acre pond that remained fishless was similarly sampled. Emergence structures constructed of window screen were placed in each pond and exuviae found on these screens were collected and sorted. For approximately every 4th sampling date, all exuviae of individuals belonging to the *Enallagrna* complex were sexed and their head capsule width was measured. From these samples, it was determined that between 30 and 60 individuals had to be examined in order to get a sex ratio representative of the population. The average head capsule size of the damselfly larvae was reduced after the addition of fish, with a greater decrease apparent in female larvae. However, no significant difference in sex ratio was apparent. Laboratory studies will seek to more specifically characterize any sex-specific differences in susceptibility to predation that may exist in this particular genus. Results such as these may prove useful in the management of aquatic habitats, since the introduction of fish to a previously fishless system may reduce effective population sizes and threaten the viability of some damselfly populations.

FLOW VISUALIZATION OF A ROTATING FLUID. Andrea Rubio and David Martin. Physics and Engineering Department, University of Central Oklahoma, Edmond, OK 73034

The successful interpretation of fluid flow patterns is an important tool used to investigate and understand the physics of motion and turbulence. Our research area is the physics of rotating fluids employing flow visualization techniques. Conventional methodology such as injection techniques used in open flow systems like channels and in air may not be easily applied to our case since the rotating fluid constitutes a closed system. Our flow visualization procedures must be introduced at the beginning of the experiment and should maintain their integrity during the course of the flow visualization procedure. An experimental observation of some visualization methods in a rotating fluid is presented, together with the result of our efforts.

PALEONTOLOGY OF THE MONARCH MILL FORMATION AT EASTGATE, CHURCHILL COUNTY, NEVADA. Kent **S. Smith.** Oklahoma State University Center for Health Sciences, College of Osteopathic Medicine, Department of Anatomy and Cell Biology, 1111 West 17th Street, Tulsa, OK 74107-1898

The first Eastgate locality (Churchill County, Nevada) was discovered by D. I. Axelrod in the late 1950s. Since the initial discovery of fossil vertebrates at Eastgate, researchers from the University of California at Berkeley (namely, D. E. Savage and J. H. Hutchison) and the University of Oklahoma (K. S. Smith and N. J. Czaplewski) have collected fossil remains from the rock exposures of the Monarch Mill Formation near the town of Eastgate. In 1995, a University of Oklahoma based expedition recovered fossil remains from numerous localities. Fossils were collected from within the volcanic tuffs that occur in the basalmost section of the Monarch Mill Formation. However, screenwashing was limited to few localities. To date, nearly 20 localities within the Monarch Mill Formation have revealed

vertebrate fossils. The Eastgate local fauna represents an assemblage of 25 families of mammals, as well as numerous fish, amphibians, reptiles, and birds from the Hemingfordian/Barstovian (Miocene) boundary. Sixty species of mammals including 18 insectivores, one chiropterian, seven lagomorphs, 33 rodents, five carnivores, three artiodactyls, and three perissodactyls are described for the Eastgate local fauna. A new species of insectivore, one new genus of rodent, and nineteen new species of rodents are described. The mammals are the focus of this study.

BIODEGRADATION OF VEGETABLE OIL BY COMMERCIAL CULTURES OF BACTERIA. Louis A. Susanto and David P. Nagle. Department of Botany and Microbiology, University of Oklahoma, Norman, OK 73019

Fats, oils, and grease (FOG) are important components in food-processing wastewater, causing pollution, nuisance odors, and drainpipe blockage. Among many cleanup options, few are considered to be highly effective and economical. Some methods add actively-growing microorganisms to grease traps to degrade floating FOG, but results are highly variable. An understanding of the cells involved in this two-phase process is needed for better reproducibility. One mixed culture (containing < 10 bacterial strains) that had been used to treat grease traps was studied. The mixed culture (MC) as obtained had only a small percentage of lipase-positive cells (5%), which decreased on repeated passages. The predominant lipase-producing organism, Strain TBI, was isolated, a Gram-negative, motile rod whose phylogeny is not yet known. TBI alone and MC were tested for degradation of FOG in 250 ml bioreactors. Concentrations of FOG (vegetable oil, 4 g/L) were assessed with a partition-gravimetric method; biomass by total suspended solids; total counts on lipase indicator plates. In eight days, strain TBI alone removed 5-10% of FOG. MC removed more, typically 20-32% over the same period. TBI cells alone increased in number about 1.5-fold. Total counts in MC increased 10-fold in the same time, where more lipid was degraded by MC. This suggests that there are microbial interactions between lipolytic cells and other strains, whose description may lead to more reliable treatments of FOG.

TROPICAL BIOLOGY CLASSES FOR NORTHEASTERN STATE UNIVERSITY STUDENTS IN BELIZEAN WATERSHEDS. Erik **Terdal[1] and** Mike Wilds[2]. [1]Biology Department, [2]Criminal Justice Department, Northeastern State University, 3100 E. New Orleans Street, Broken Arrow, OK 74014

Tropical rainforests and coral reefs are the two most species-rich ecosystems on Earth. Together, we have taken over 50 college students from Oklahoma to study these and other tropical ecosystems in the Central American country of Belize since 1999. The courses offered have been entitled "Coral Reef Ecology," "Tropical Ecology, " "Tropical Wildlife," and "Wildlife Law." Students have been majors in biology, fish and wildlife biology, environmental management, and criminal justice. The age and work history of the students also varies. We view the diversity of student backgrounds as a strength of the program. The courses have a central organizing theme of human interaction with watershed resources. In part, this is to help students make connections with watershed resource issues in Oklahoma. Overseas travel to a developing country requires planning and expense, but it affords once-in-a-lifetime educational opportunities for our students. Lectures prior to the trips cover theoretical material in a fast, efficient manner. Discussions of health and safety concerns help students prepare for the travel to Belize. In Belize, we use a combination of rented vans and motor boats to spend two to three days in each of several ecosystems encountered as rivers move from mountain to sea: mountain pine forests, tropical rainforests, savannas, mangrove swamps, and finally coral reefs. Students keep a journal to record observations

and data on the biology of these systems, as well as conversations with local people who live in these ecosystems and make their livelihood from their resources. Students return to Oklahoma with a greater appreciation of their relationship with the world at large.

BIOACCUMULATION OF TRACE METALS AND ASSOCIATED EFFECTS IN FRESH WATER TURTLE EGGS. Lee Anne Tome-Moeller and Joseph R. Bidwell. Department of Zoology, Oklahoma State University, Stillwater, Oklahoma 74078

Red-eared slider turtles *(Trachemys scripta)* lay their eggs in terrestrial nests where they are in contact with the substrate. In contaminated environments, there is a potential for effects on developing embryos if uptake occurs through the eggshell. To evaluate this issue, T. *scripta* eggs were incubated in metal (zinc, cadmium, and lead) contaminated substrate (as high as 9300, 56, and 540 mg/kg Zn, Cd, and Pb, respectively) or exposed to metals via direct application of metal solutions to eggshells (maximum concentrations: 6400, 79, and 440 mg/L Zn, Cd, and Pb, respectively). Total and bioavailable metal concentrations in the substrates were determined, as were total metal levels in eggshells, turtle shells, and turtle tissues minus the shell at hatching. The effects of metal exposure on the physiological energetics of developing embryos were also assessed, with metabolic rates of embryos within eggs measured weekly. Yolk sacs of freshly laid eggs and hatchlings were analyzed for caloric content using bomb calorimetry to determine differences among treatments in yolk consumption during development. *T. scripta* eggs accumulated Zn, Cd, and Pb from incubation substrates and metal solutions in a dose-dependant fashion, with bioaccumulation factors as high as 22. In the substrates containing the highest levels of Zn, Cd and Pb, mean metal concentrations in turtle tissues increased almost 12, 9 and 600 fold, respectively between oviposition and hatching. No differences in embryo metabolic rates or yolk consumption were observed. However, metal accumulation results indicate that T. scripta eggs may be good biomonitors of metal contamination in terrestrial substrates.

EFFECTS OF COPPER ON INVERTEBRATE COMMUNITY DEVELOPMENT IN EPHERMERAL WETLANDS. Sara E.Watt and Joseph R. Bidwell. Department of Zoology, Oklahoma State University, Stillwater, OK 74078

Ephemeral ponds are ubiquitous throughout Oklahoma and they provide habitat for many aquatic invertebrates. These habitats exhibit significant fluctuations in their hydrologic regime that directly affects the physical and chemical conditions of the aquatic system. The fauna present in these shallow bodies of water form resting stages that remain in the sediments during dry periods and emerge as the pond fills with water. The presence of a contaminant could alter the invertebrate community that develops in an ephemeral pond by influencing emergence and/or survival of the organisms. The objective of this study was to determine if the use of microcosms is an appropriate approach to assess the effects of a chemical stressor on the emergence and survival of invertebrates derived from ephemeral ponds. Laboratory microcosms containing pond sediments were hydrated with clean water or solutions of copper chloride ($CuC1_2$), and emergence of invertebrates was monitored over 14 days. Control microcosms indicated a predictable temporal trend in taxa emerging from the sediments, with up to 6 orders of invertebrates present. The coefficient of variation for the total number of invertebrates that emerged between each of the control replicates ranged from 26 to 36%. The use of microcosms provided an effective method to determine that copper significantly influenced both the type and the number of organisms that emerged from the sediments, with effects apparent between 4 and 50 ug/1 of copper. Additional experiments will examine organophosphate pesticide effects on emergence and variability in response between different ephemeral ponds.