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Cover Photographs: Samford Hall on the campus of Auburn University, Auburn, Alabama, site of the 78th Annual meeting of the Alabama Academy of Science

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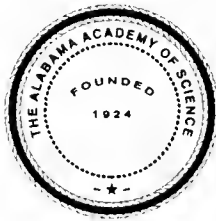Lawrence C. Wit, College of Science and Mathematics, Auburn University, Auburn, AL 36849

BENEFACTORS OF THE JOURNAL OF THE ALABAMA ACADEMY OF SCIENCE

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ABSTRACTS

Papers presented at the 78th Annual Meeting
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BIOLOGICAL SCIENCES

GOLDFISH (*CARASSIUS AURATUS*) SEE BETTER THAN PEOPLE (*HOMO SAPIEN*). Michael S. Loop, Dept. of Physiological Optics, UAB, B'ham, AL 35294.

At behavioral detection threshold intensity, normal humans, macaque monkey, and goldfish all see a spectral light as colored when presented upon a white background. This high color vision sensitivity is the foreseeable consequence of responding by wavelength opponent neurons which, everyone agrees, mediate color vision. In macaque and humans, color vision sensitivity is so high that a sub-threshold white light becomes visible if passed through a broadband red filter (Kodak Wratten #25). Goldfish, although they can discriminate between middle and long wavelength lights at threshold, did not show improved detection, over white light, by using a red filter.

Last year we argued that the above state of affairs could be accounted for by the fact that goldfish, unlike macaque and presumably humans, have a population of retinal ganglion cells solely excited by long wavelength cones, i.e. no inhibition. Subsequent reflection upon this conjecture lead to the inescapable prediction that goldfish should be more sensitive than humans to any light containing long wavelengths, e.g. white or red. Determining detection thresholds for six humans, with the same apparatus used to study the goldfish, tested this prediction. As reasoned thought suggested, but surprising nonetheless, the goldfish's increment thresholds were 3.8 times lower (e.g. better) than the humans' for both white and long wavelength light.

EFFECTS OF MYCOPLASMA GALLISEPTICUM ON REPRODUCTIVE SUCCESS IN BREEDING HOUSE FINCHES.

Paul M. Nolan, Sharon R. Roberts, and Geoffrey E. Hill. Dept. of Biological Sciences, 331 Funchess Hall, Auburn University, AL 36849.

Long known as a pathogen of poultry, *Mycoplasma gallisepticum* (MG) began infecting house finches in 1994. The disease rapidly spread throughout the eastern U.S. and Canada, and was associated with debilitating disease and high mortality in house finches. In recent years, however, the proportion of infected finches dying as a result of infection with MG seems to have declined, and asymptomatic infection is now more common among wild birds than in the past. We document MG infections in breeding house finches and confirm that adults of both sexes transmit the infection to dependent young, probably after hatch. MG infections of breeding adults occurred late in the breeding season, and were found in birds completing significantly more nests than birds that never tested positive for MG, implying that higher rates of reproduction carry a cost in the form of increased risk of infection. We find evidence of an MG-induced delay in dispersal of nestlings from their natal area, and demonstrate a significant impact of MG infection on nestling growth.

DIAMONDBACK TERRAPINS IN THE VICINITY OF MOBIL BAY- A PRELIMINARY STATUS REPORT.

David H. Nelson and Krista K. van Amerongen, University of South Alabama, Mobile, AL 36688. John J. Dindo, Dauphin Island Sea Lab, Dauphin Island, AL 36528. Roger C. Wood, Stockton State College, Pomona, NJ 08240.

A consortium of interested parties in coastal Alabama recently organized itself to study the status of terrapins (*Malaclemys terrapin pileata*) in the vicinity of Mobile Bay. Our goal was to establish the distribution and abundance of terrapins, as well as to promote the conservation of this beleaguered species. Terrapins in this region have not been previously studied. Conversations with local fishermen and biologists, preliminary field reconnaissance and limited photographic documentation have established the presence of terrapins in a number of different locations. In one preliminary study at the airport salt marsh on Dauphin Island, 9 hatchlings were observed, marked and released, although no turtles were captured in 12 crab traps over an 8-week period in June and July 2000. It appears that increased terrapin activity there may occur during the early spring (March and April). In another preliminary study, 12 modified crab traps were set out in salt marshes of Weeks Bay for 5.5 weeks during July and August 2000. No diamondback terrapins were ever encountered there. Discussions with crabbers, fishermen, and state biologists confirm that terrapins are captured in crab traps along coastal Alabama. Field trips to potential nesting sites disclosed nest predation at Port Aux Pines, Heron Bay and Coffee Island. Terrapins are present in a number of localities. However, the full extent of their distribution within the study area, as well as the basic parameters of the population in this region, remain to be determined.

THE EFFECT OF GENDER AND REPRODUCTIVE STATUS ON SERUM AMYLASE AND ACID PHOSPHATASE ACTIVITY IN RABBITS.

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The purpose of our experimentation at this time was to characterize the normal pattern of the enzymes amylase and acid phosphatase in the serum of normal fertile rabbits during estrus, post-ovulation (24, 72 hr. after hCG) and pseudopregnancy (7 & 14 days after hCG). Females exhibiting no signs of estrus and male rabbits were also evaluated and compared. Our findings revealed that amylase activity in the peripheral blood of fertile females during varying phases of their reproductive cycle ranged from 70.05 u/l to 134.55 u/l. The results further revealed that serum acid phosphatase activity in fertile rabbits regardless of gender, ranged from 5.25 u/l to 11.67 u/l, similarly to those previously reported. In general, however, mean serum amylase levels in males were slightly lower and inversely, mean acid phosphatase levels were slightly higher when compared to females. Characterization of normal enzyme (amylase & acid phosphatase) activity in the serum of rabbits during estrus, post-ovulation (24, 72 hr. after hCG) and pseudopregnancy (7 & 14 days after hCG) has not been previously reported and little attention has been given to the non-digestive functions of these two specific enzymes. Thus, determining the normal secretory pattern of activity is quintessential to our understanding of the physiological mechanisms that pertain to local production or inhibition of these enzymes (amylase & acid phosphatase) in the reproductive tract of the female or the male.

ASSESSMENT OF THE ROLE OF G-PROTEINS IN REGULATION OF ECDYSTEROIDOGENESIS IN BLUE CRAB (*CALLINECTES SAPIDUS*) Y-ORGANS.

Deug Woo Han and R. Douglas Watson, Department of Biology, University of Alabama at Birmingham, AL 35294.

In decapod crustaceans, a neuropeptide molt-inhibiting hormone (MIH) suppresses ecdysteroids synthesis by Y-organs. Cyclic AMP has been implicated as a second messenger in MIH action. Since heterotrimeric Gs-proteins are known to be involved in cAMP-mediated responses, we assessed the presence of Gs-proteins in blue crab (*Callinectes sapidus*) Y-organs. Cholera toxin-catalyzed ADP-ribosylation did not reveal Gs-like proteins in Y-organs. However, immunoblot analysis, using antibodies raised against vertebrate Gsα, revealed an immunoreactive band of the predicted size (~49kD) in Y-organ and control tissue (blue crab thoracic ganglion and mouse brain). The results indicate that Gs-like proteins are present in blue crab Y-organs. We are currently investigating the functional link of G-protein activation to regulation of ecdysteroidogenesis. Funded by MS/AL Sea Grant (NA86RG0039).

CATTLE EGRET IN ALABAMA. Julian L. Dusi, Dept. of Biological Sciences, Aubuan University, Auburn University, Ala. 36849 and Rosemary D. Dusi, 560 Sherwood Dr., Auburn, Ala. 36830

The Cattle Egret (Bubulcus ibis) was first found in Alabama in the late 1950's. By the 1960's it had abundantly spread to colonies in the coastal plains of Alabama and to occassional colonies as far north as Decatur, Alabama. It became the most common heron in the state and continued so into the 1990's. In the mid-1990's the spring and early summer drought conditions limited its food and caused it to nest only in colonies in the lower coastal plain and the off-shore island colonies. As the drought continued into 2000, the colonies on coastal islands were its last stronghold in Alabama.

Of the herons of Alabama, the Cattle Egret is the only species so greatly affected by drought. This is because drought causes pasture grasses to shrivel and no longer support large populations of insects, which are the main food the Cattle Egret feeds to its nestlings.

RELEASE AND DEGRADATION OF SORBED 2,4,6-TRINITROTOLUENE BY A MICROBIAL CONSORTIUM.

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2,4,6-Trinitrotoluene (TNT), a relatively water soluble nitroaromatic compound, is a common pollutant in soil and groundwater at sites with substantial military activities, such as those associated with munition production, handling, testing, and disposal of explosive and propellent materials. Because of its recalcitrant properties, contamination of TNT in soil represents a significant worldwide environmental problem. The potential release of sorbed TNT for microbial destruction was tested in soil under cultivation by a tropical legume *Sesbania rostrata.* The amount of TNT sorbed to soil was determined by subtracting the amount in aqueous phase from the amount initially added. In biodegradation experiments, a bacterial consortium isolated from soil sample obtained from a TNT-polluted site was able to mineralized 25% of freshly added TNT in soil slurries in 7 days. On the other hand, less than 5% of the TNT was mineralized in soil where the explosive was allowed to age for 120 days. Upon introduction of Seedlings of *S. rostrata* into the TNT-aged soil, a dramatic increase in the rate of mineralization of TNT (10 μg/g) was observed. The maximum rate varies from 0.05 to 0.07% per day. Because mineralization of sorbed TNT was greater in the presence of *S. rostrata,* and TNT and its metabolites 4-amino-2,6-dinitrotoluene (4-ADNT) and 2-amino-4,6-dinitrotoluene (2-ADNT) were found throughout the plant, it appears that the plant may alter the release and degradation of the highly toxic contaminant.

HABITAT USE BY NEOTROPICAL MIGRANT SONGBIRDS AT AN ATLANTIC COASTAL STOPOVER SITE.

Scott G. Somershoe, Dept. Biol. Sciences, Auburn Univ., Auburn, AL 36849.

Transient songbirds often stopover in small isolated oak hammocks that are interspersed among the marshes of coastal South Carolina and Georgia. We tested whether the use of these hammocks by migrants is influenced by the size of the hammock or the structure of the habitat. During both spring and fall migration, the total number of Neotropical migrant species (range in Spring: 12-27, Fall: 12-21) and mean number of Neotropical migrant individuals recorded per day (range in Spring: 3.1-11.3, Fall: 5.9-32.9) varied significantly among eight hammocks at the Savannah National Wildlife Refuge, Jasper Co., South Carolina. In addition, a significant positive relationship was found between area and the total number of Neotropical species and mean number of Neotropical individuals recorded per day during both spring and fall migration. Although more individuals and species were found in larger hammocks, migrants were not distributed equally on a per hectare basis. Hammocks differed significantly in overall tree and shrub density, but variation in the number of species and abundance of individuals was unrelated to habitat. In conclusion, the size of oak hammocks appears more important to migrant songbirds than the structure of the habitat.

TEMPERATURE INFLUENCES FEEDING CHARACTERISTICS OF TWO SYMPATRIC CRAYFISH SPECIES.

Suzanne L. Croll and Stephen A. Watts, Dept. of Biology, Univ. of Ala., Birmingham, AL 35294

The red swamp crayfish *Procambarus clarkii* (PC) and the white river crayfish *P. zonangulus* (PZ) are of ecological and commercial importance. The effects of temperature on feeding characteristics were investigated. Feeding parameters were examined after exposure for 3 weeks at 8, 14, 20, 26, or 32 C. At 32 C, PC consumed significantly more feed (25% body weight per d) than PZ (10% body weight per d); consumption did not vary between species at all other temperatures. Consumption averaged 5 and 10 % body weight per d at 26 C in PC and PZ, respectively, a temperature near their reported thermal optimum. Consumption was minimal at 8 C. Dry matter absorption ranged from 55-75% regardless of sex, species, temperature, or rate of consumption. Carbohydrate absorption efficiency increased in both species from approximately 20% to 60% as temperature increased from 8 to 32 C. In contrast, protein absorption efficiency decreased from 45% to 10% as temperature increased from 8 to 32 C. The total amount of protein absorbed increased about 10-fold for both species as temperature increased from 8 to 26 C in PZ and 8 to 32 C in PC. The total amount of carbohydrate absorbed increased from 0.01g to 1.3g in PZ, and 0.01g to 2.6g in PC as temperature increased from 8 to 32 C. Species-specific differences suggest that PC may have a potential advantage at high temperatures. The protein:energy requirements for these species change with acclimation temperature. Supported by the Alabama Academy of Science.

PROMOTER ACTIVITY OF THE TELOMERASE GENE IN DIFFERENTIATING HUMAN TERATOCARCINOMA (HT) AND PROMYELOCYTIC LEUKEMIC (HL-60) CELLS.

Sabita Saldanha, Trygve Tollefsbol, Joyce Haskell, Sefali Parikh, Nadeja Lopatina, Lucy Andrews, Mark Casillas and Latoya Fitzpatrick, Dept. of Biology, University of Alabama at Birmingham, AL 35294-1170.

Telomerase, a reverse transcriptase enzyme, maintains chromosomal stability by adding tandem repeats of the $(TTAGGG)_n$ sequence at the termini. The enzyme is composed of two main subunits, the rate limiting catalytic unit, hTERT, and the human telomerase RNA (hTER), which serves as a template for the addition of the repeats. Telomerase activity is up-regulated in germ cells, immortalized cells and in 85-95% of cancer cells and repressed in most normal somatic and senescent cells. Telomerase-positive HT and HL-60 cells were induced to differentiate by retinoic acid (RA) for 1, 3, 6, 9, and 12 days and transiently transfected with hTERT promoter constructs (P-3996, P-1009 and P-330) containing the luciferase gene. Promoter activity was assessed using the Dual Luciferase Assay System. In HT cells, P-3996 had an 8 fold increase in activity when compared to the other two constructs after 3 days of RA treatment and activity subsequently decreased. hTERT promoter activity also declined with differentiation of HL-60 cells. In addition, our studies have shown that *de novo* DNA methyltransferase activity increases up to 6 days of RA treatment in HT cells. As DNA methyltransferases are known to be regulators of gene expression, our recent observations of promoter activity suggest that DNA methylation could be a mechanism for the down-regulation of hTERT expression during differentiation.

EFFECT OF GLUCOSE ANALOGUES AND GLYCATION REVERSAL AGENTS ON GLUCOSE TOXICITY IN A HALOPHILIC BACTERIUM ISOLATED FROM AN INLAND SALT SPRING.

Archie Dean Hooper, IV and Donald W. Salter, Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Our laboratory is studying the properties of exoenzymes produced by some of the halophilic and halotolerant bacteria that exists in an inland salt spring near Jackson, AL. Previous research in our laboratory demonstrated that the colonial growth of one isolate, RS6GS, was severely inhibited by the presence of glucose and other carbohydrates in the medium. It is well known that glucose can be toxic to cells under certain conditions through at least two possible mechanisms. It can either directly glycate and inactivate key biological molecules involved in growth or be metabolized to the toxic compound methylglyoxal. We previously reported, using a quantal assay, that the nonmetabolizable glucose analogues, 2-deoxyglucose and 3-O-methylglucose, did not mimic glucose's toxicity on RS6GS. Further, several different glycation reversal agents appeared to have little effect on the growth inhibition of RS6GS by glucose. We have expanded these data by quantifying the effect of these compounds on the growth of RS6GS by performing viable colony counts. Again, neither of the glucose analogues mimicked glucose's negative effect on RS6GS growth. However, two glycation reversal reagents, metformin and aminoguanidine, did give partial relief to the growth inhibition of RS6GS by glucose. These and other data suggest that the toxic glucose metabolite, methylglyoxal, is involved in the glucose-inhibited growth of RS6GS.

STRUCTURALL-BASED PLUMAGE COLORATION IS AN HONEST SIGNAL OF MATE QUALITY IN EASTERN BLUEBIRDS. Lynn Siefferman and Geoffrey Hill, Department of Biological Sciences, Auburn University, Auburn, AL, 36849.

Sexual selection explains the evolution of exaggerated male sexual ornaments in terms of differential reproductive success of individuals. The Honest Advertisement Theory proposes that the traits that are elaborated by sexual selection serve as indicators of male quality. We have investigated the signaling function of blue plumage in a wild population of eastern bluebirds and found that structurally-based plumage may act as a signal of male quality to conspecifics. We have found that the intensity of blue plumage varies among the adult males. Brighter blue males pair earlier in the season than duller males. Male bluebirds proved food to their females during incubation. Brighter blue males provision their mates more often than do duller males. Thus, plumage blueness may reliably signal a male's ability to attract a mate and females who mate with such males benefit through food resources.

HABITAT USE AND MOVEMENT PATTERNS OF INCUBATING WOOD DUCKS (AIX SPONSA) AT EUFAULA NATIONAL WILDLIFE REFUGE, ALABAMA. Travis H. Folk and Gary R. Hepp, School of Forestry and Wildlife Sciences, Auburn University, Auburn, Al, 36849.

Incubating birds must maintain a certain level of constancy (i.e. time spent on nest) for embryos to develop successfully. For some waterfowl species, factors such as age, breeding experience, and habitat quality have been shown to influence incubation constancy. For wood ducks, incubation constancy varies among females but is not influenced by body mass of females at the start of incubation or mass of females during incubation. In this study, we tested whether variation in habitat use and movements of females during incubation recesses influenced incubation constancy. We collected data on habitat use and incubation behavior for 41 and 40 females, respectively, over two years (1999 and 2000). Incubating females preferred beaver ponds, creeks, ephemeral wetlands, and lake influenced wetlands, and habitat preferences were not influenced by year, age, or initiation date of incubation. Mean distance traveled during incubation recesses, standard deviation of distances, early incubation body mass, and percentage of beaver pond habitat within the feeding range did not explain variation in incubation constancy. However, females that nested early in the season had higher constancies than those did that nested later. Results illustrate that incubation constancy of female wood ducks was not constrained by differences in the distances moved or in the habitat used by females during incubation recesses.

ENVIRONMENTAL EFFECTS ON A PROTEASE EXOENZYME PRODUCED BY A HALOPHILIC BACTERIUM ISOLATED FROM AN INLAND SALT SPRING.

Grant Goldenstar, III and Donald Salter. Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Microorganisms inhabit a unique inland salt spring ecosystem near Jackson, AL in salinities ranging from 0 to approximately 100 ppt (about 3-fold higher than ocean salinity) in the surface waters. Halophilic bacteria have been isolated from this ecosystem using a complex selective growth medium containing 4.3 M NaCl, 0.07 M KCl, 0.04 M $MgSO_4$ and 0.002 M $CaCl_2$. The protease exoenzyme produced by one of the halophilic isolates, RS6GS, was further characterized. Divalent cations are required for protease activity since EDTA abolished its activity on gelatin. Excess $MgSO_4$ or $CaCl_2$ can regenerate active enzyme when added to EDTA-inactivated enzyme. Native enzyme in growth medium is stable at $50°C$ for at least 2 hours but is inactivated in a time dependent manner at $55°C$. It is stable at $-20°C$ for over one year, and to repeated freezing and thawing. Inorganic salts are required for bacterial growth but does not appear to be required for enzyme activity since dialyzed enzyme is as active as native enzyme. In addition, 4.3 M NaCl and 3.4 M KCl had little effect on protease activity. However, dialyzed enzyme is more unstable to heat than native enzyme. Dialyzed enzyme can be partially protected against inactivation by including only NaCl and $CaCl_2$ in the incubation medium. Thus, the protease exoenzyme produced by this halophilic bacterium is stable at a wide range of temperatures and salt concentrations but requires NaCl and $CaCl_2$ for heat stability.

SODIUM CHLORIDE REQUIREMENTS AND EXOENZYME PROFILES OF BACTERIA ISOLATED FROM SALINE ENVIRONMENTS.

Patricia Graham and Donald Salter. Department of Biological and Environmental Sciences, University of West Alabama, Livingston, AL 35470

Microorganisms are capable of surviving and growing in a wide range of salinities. In addition, some organisms produce a variety of exoenzymes for degrading large extracellular biological molecules for metabolism. Halophilic and halotolerant bacteria that exist in saline environments from a unique inland salt spring ecosystem near Jackson, AL and coastal saline waters near the Gulf of Mexico were isolated from a complex selective liquid growth medium containing 4.3 M NaCl, 0.07 M KCl, 0.04 M $MgSO_4$ and 0.002 M $CaCl_2$. Approximately 21% of the 28 isolates grew on a complex solid medium without added inorganic compounds, 68% required the above inorganic compounds without NaCl (but NaCl stimulated growth), and the remainder (11%) had an absolute requirement for NaCl to grow. All isolates grew at 3 and 10% NaCl and all but one grew at 17% NaCl. Only 31% of the isolates grew (but at reduced levels) at 25% NaCl. Approximately 20% of the isolates produced amylase, DNAase, lipase, and protease exoenzymes. Most of the exoenzyme-positive isolates produced all four exoenzymes. Some of the remaining isolates appeared to produce DNAse at reduced levels. Thus, bacteria in diverse saline environments have a wide range of salt requirements with variable production of exoenzymes.

TARDIGRADE DIVERSITY IN THE MOSS *ULOTA CRISPA* FROM TREE CANOPIES IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK—A PRELIMINARY REPORT. <u>Amanda K. Hooie</u>, Paul G. Davison, Dept. of Biology, Univ. North Ala., Florence, AL 35632, and Diane R. Nelson, Dept. of Biological Sciences, Johnson City, TN 37614.

In the summer of 2000 a team of student researchers from Central Missouri State University collected bryophytes and lichens from tree canopies in the Great Smoky Mountains National Park. From their collections we are extracting tardigrades (water bears) from the moss *Ulota crispa*. The tardigrades (eggs or animals) are mounted individually in Hoyer's medium on separate microscope slides. To date, we have processed 5 cushions of *Ulota crispa* (moss cushions were 2-4 cm in diameter) from four trees: one from *Acer saccharum* (Cades Cove); one from 55 ft. above ground from *Betula lenta* (Ramsey Cascades); one from 6 ft. above ground from *Acer rubrum* (Cades Cove) and two from 63 ft. & 70 ft. above ground from *Tilia* sp. (Twin Creeks). Tardigrades were abundant in all moss cushions. To date, 150 slides have been prepared: 50 slides from the *Acer rubrum* sample and 25 slides each from the remaining samples. In the class Heterotardigrada, the following genera have been identified: *Echiniscus* (2 species), *Hypechiniscus* (1 species), and *Pseudechiniscus* (at least 2 species). In the class Eutardigrada, the following genera have been identified: *Milnesium* (1 species, male and female), *Minibiotus* (1 species), and *Macrobiotus* (at least 2 species). Trends in species distribution will not be discernible until more data are available.

NATURAL GROWTH RATES OF *AMBYSTOMA MACULATUM*. <u>Eric A. Blackwell</u>, Robert A. Angus, Ken R. Marion, Dept. of Biology, Univ. of Ala. at Birmingham, Birmingham, AL 35294 and George R. Cline, Dept. of Biology, Jacksonville State Univ., Jacksonville, AL 36265.

The spotted salamander, *Ambystoma maculatum*, is a widespread species that occurs throughout the eastern United States into southern Canada. In January 1997 we initiated a long-term study of *A. maculatum* at a breeding pond in Calhoun County, Alabama. Individuals had PIT tags inserted for positive identification which allowed us to use the von Bertalanffy growth interval equation to estimate intrinsic growth rates for both males and females. For this population, males displayed a pattern of rapid juvenile growth, which slowed as they neared the estimated maximum size, but females displayed relatively constant growth until nearing their estimated maximum size. The intrinsic growth rate estimated for females was lower than that estimated for males. We hypothesize that female growth may be lower than males due to more energy being initially allocated to reproductive structures.

PREDICTION OF HATCHLING KEMP'S RIDLEY SEX RATIOS PRODUCED AT RANCHO NUEVO, MEXICO.

Alyssa Geis and Thane Wibbels, Dept. of Biology, Univ. of Ala. at Birmingham, Birmingham, AL 35294.

The Kemp's ridley sea turtle, *Lepidochelys kempi*, is the most endangered sea turtle in the world. It possesses temperature-dependent sex determination (TSD) in which the incubation temperature of the egg (during the approximate middle third of incubation) determines the sex of the hatchling. Past studies have suggested that TSD has the potential of producing highly biased sex ratios, which may not be advantageous to the recovery of endangered sea turtle populations. Therefore, it is of great importance to monitor hatchling sex ratio production in nesting beach conservation programs. The primary nesting grounds of the Kemp's ridley is located on a stretch of beach near Rancho Nuevo, Mexico, where an international conservation effort (coordinated by Instituto Nacional de la Pesca) monitors all nesting and relocates all nests to protected areas (i.e. egg corrals). Incubation temperatures were recorded in approximately 270 nests during the 1998, 1999, and 2000 nesting seasons. Sex ratios were predicted for the nests based on incubation temperature during the middle third of incubation. During all nesting seasons, the incubation temperatures in the majority of the nests were relatively warm and suggested the production of either 100% females or female biases, while a minority of nests was predicted to produce male biases. The data suggest that a significant female bias was produced during all three nesting seasons. The biased sex ratios predicted during the current study exemplify the need to monitor hatchling sex ratios produced in sea turtle conservation programs. Such information is a prerequisite to the development of an effective management strategy for endangered populations.

AROMATASE mRNA LEVELS DURING TEMPERATURE-DEPENDENT SEX DETERMINATION IN A REPTILE.

Chris Murdock and Thane Wibbels, Dept. of Biology, Univ. of Ala.-Birmingham, Birmingham, AL 35294.

The red-eared slider turtle, *Trachemys scripta*, like most turtles, employs temperature-dependent sex determination (TSD) as a means of determining the sex of the developing embryo. Past studies have suggested that estrogen production during development is important for TSD, and that the control of various elements (e.g., steroidogenic enzymes) involved in estrogen biosynthesis could represent temperature-sensitive elements. The expression of one particular enzyme, aromatase, is of interest since it is critical in the estrogen biosynthesis pathway.

In the reported study, a sensitive assay technique (i.e., quantitative competitive RT-PCR) was developed for measuring *T. scripta* aromatase mRNA levels during TSD. Total RNA extracted from adrenal/kidney/gonadal (AKG) tissues at developmental stages 15, 17, 19, 21, 23 and hatching were assayed (at both male- and female-producing temperatures). This quantitative competitive RT-PCR was used to quantify the abundance of aromatase mRNA levels during embryonic development, thus providing a chronology of aromatase expression during TSD in the red-eared slider turtle.

IDENTIFICATION AND CHARACTERIZATION OF *cspG* IN *Vibrio vulnificus*.

Greer E. Kaufman and Asim K. Bej, Dept. of Biology, Univ. of Alabama at Birmingham, AL 35294-1170.

Vibrio vulnificus is a halophilic marine bacterium that thrives in warm coastal waters and remains in a dormant state during the winter months. Recent studies in our laboratory have focused on the environmental conditions that allow *V. vulnificus* to adapt to cold temperatures and remain dormant. To study the adaptive nature of *V. vulnificus*, cultures were grown at 35°C, 15°C, 6°C, 15→6°C in filter-sterilized water from the Gulf of Mexico supplemented with 0.5% (w/v) peptone. When *V. vulnificus* was exposed to 15°C for 2 hours before exposure to 6°C, a 1-2 log increase in viability was observed when compared to the 6°C culture. A homolog to *Escherichia coli* and *Shewanella violacea cspG* was identified in *V. vulnificus* by PCR amplification, which may assist in the adaptation to cold temperature. The amino acid sequence of *V. vulnificus* CspG exhibited 74% and 85% homology with *E. coli* and *S. violacea*, respectively. The presence of CspG was further confirmed with western blot analysis. The possible role of *cspG* in the adaptation of *V. vulnificus* is currently being investigated.

SERUM-INDUCED RESPONSE OF *Vibrio vulnificus* .

Michael L. Myers and Asim K. Bej, Dept. of Biology, Univ. of Alabama at Birmingham, AL 35294-1170.

Vibrio vulnificus is a marine bacterium that is commonly accumulated in shellfish during the filter feeding process. Almost every year there are outbreaks of *V. vulnificus* infections resulting from the consumption of raw or undercooked shellfish, particularly raw oysters. It is therefore important to develop a method for rapid detection of this pathogen in oysters to help prevent such outbreaks. Increasing the growth rate of this microorganism would decrease the time necessary for its detection using conventional microbiological methods as well as genetic-based methods. Culturing of this bacterium in medium supplemented with serum (10% v/v) significantly increases the growth rate. After only two hours, a 3-log increase in viability was observed in serum-supplemented medium as compared to the same medium without serum. Addition of serum to the enrichment medium used to culture *V. vulnificus* could decrease the time necessary to detect this organism in oyster samples. Possible mechanisms for such rapid growth when exposed to a medium supplemented with serum were investigated. Differential expression of several proteins was observed in response to serum. In addition, a degenerate oligonucleotide probe synthesized from the deduced amino acid sequence of a serum-induced protein isolated from the bacterium *Corynebacterium jeikeium* hybridized to purified *V. vulnificus* genomic DNA. These findings suggest there may be genes in *V. vulnificus* expressed in response to serum that play a role in the observed rapid growth. The use of serum in the rapid detection of this pathogen could lead to fewer incidences of illness and death as a result of its consumption in shellfish.

PATIENT'S RECOGNITION OF SIGNS AND SYMPTOMS OF STROKE.

Dena M. Guy (Joan Grant), University of Alabama School of Nursing, University of Alabama at Birmingham, Birmingham, AL, 35294-1210

Stroke continues to be a major source of morbidity and mortality in the United States. Although prompt treatment is essential in decreasing functional and cognitive deficits associated with a cerebrovascular accident, it is unclear what signs and symptoms cause individuals to conclude they might be experiencing a stroke. Therefore, the purpose of this study was to identify signs and symptoms that assist individuals to decide if they had a stroke. The research project utilized a descriptive design and both quantitative and qualitative methods were used to obtain data. Of the subjects interviewed, ninety percent of the subjects manifested one or more risk factors for stroke. In addition, 80% of the subjects did not recognize the signs and symptoms as indicating a stroke in evolution. Of the two subjects who recognized their symptoms and correctly attributed them to stroke in evolution, one had previously experienced a stroke, but neither sought immediate medical care. Subjects recognized a variety of signs and symptoms. With prompting, recognition of specific signs and symptoms generally increased. Potential nursing implications include identifying patients who manifest risk factors for stroke and educating this population regarding the signs and symptoms of stroke in evolution and that such signs and symptoms warrant a medical emergency. This study is supported in part by the Nu Chapter, Sigma Theta Tau, the international honor society of nursing.

PRELIMINARY ANALYSIS OF WATER AND SEDIMENT EXTRACTS FROM LOGAN MARTIN LAKE, SNOW AND CHOCCOLOCCO CREEKS BY THE FROG EMBRYO TERATOGENESIS ASSAY - *XENOPUS* (FETAX) DEVELOPMENTAL TOXICITY ASSAY.

Carla Harper, Corrine Milligan, and Roger Sauterer, Department of Biology, Jacksonville State University, Jacksonville, AL 36265.

The Choccolocco Creek /Logan Martin Lake watersheds are of environmental concern due to PCB contamination of Snow and Choccolocco Creeks from a Monsanto plant in Anniston and high nutrient levels in Logan Martin Lake. In order to assess the potential effects of these pollutants on aquatic animals under controlled laboratory conditions, we analyzed water and sediment extracts from five sites on Snow and Choccolocco Creeks and Logan Martin Lake by the FETAX developmental toxicity assay, a standardized toxicity assay using early *Xenopus* embryos. Preliminary data from three or more experiments at each site indicates no consistent differences in embryonic mortality, malformation or growth from both Logan Martin Lake sites and the sites on lower Choccolocco Creek and Snow Creek (near the Monsanto plant). However, the site on Choccolocco Creek just downstream of its confluence with Snow Creek shows statistically significant growth inhibition and non-significant increases in mortality and malformations. We tentatively conclude that there may be potential toxic hazards in upper Choccolocco Creek and plan further analysis of this and the other sites in order to make more confidant conclusions.

ACCLIMATION INCREASES LOW TEMPERATURE TOLERANCE IN FINGERLING GMT^{TM} *OREOCHROMIS NILOTICUS.*

Scott C. Hofer and Stephen A. Watts, Dept. of Biology, Univ. of Ala. at Birmingham, AL 35294-1170.

Genetically male tilapia (GMT^{TM}) are produced by crossing XX female and YY male broodstock, exhibit heterosis, and are favored for aquaculture. As a tropical species, temperature dictates survivorship and production during the valuable outdoor growing season in temperate climates. To determine temperature tolerance, we exposed fingerlings (ca. 2 to 20 g; n=90-150) reared at 28 C for several weeks to reduced temperatures for 24 hr and then placed back into 28 C for 72 hr. Greater than 98% of the fingerlings survived the initial exposure to 20 C and the subsequent recovery period. Survivorship was 91, 80, 43 and 0% at 18, 16, 14 and 12 C, respectfully. We then determined if pre-exposure to a cooler temperature would enhance survivorship. Fingerlings held previously at 28 C were exposed to 20 C for 4 d, transferred acutely to low temperatures, and returned to 28 C for a recovery period of 72 hr. Survivorship was generally enhanced following pre-exposure, with survivorship values of 97, 80, 72, and 23% at 18, 16, 14 and 12 C, respectively. In both experiments, most of the fingerlings died during the initial exposure period with some additional deaths occurring in the first 24 hr of the recovery period. Those fish that died were significantly smaller (average 5.8 g) than those that survived (average 9.6 g), suggesting small fingerlings are more susceptible to cold stress than larger fingerlings.

GLUCOSE LEVELS IN THE COELOMIC FLUID VARY WITH DIET IN THE SEA URCHIN *LYTECHINUS VARIEGATUS.*

Rebecca L. Worrell, S.A. Watts, Dept. of Biology, Univ. of Ala. at Birmingham, AL 35294-1170. B. Gower, Dept. of Nutrition Sciences, Univ. of Ala. at Birmingham, AL 35294

We hypothesize that glucose has an important role in nutrient translocation in the coelomic fluid of the sea urchin. Previous studies have shown that glucose levels were minimal in several species of sea urchins. The glucose levels in individuals actively consuming a formulated diet (32% protein) had glucose levels of approximately 30 mg/dL, as determined by Ektachem analysis. Following starvation overnight glucose levels decreased below detection thresholds (<20 mg/dL), suggesting that glucose is translocated from the gut into the coelomic fluid during feeding and removed rapidly into surrounding tissues. In a subsequent experiment, individuals (n=9) fed a low protein (14%)/ high carbohydrate diet had glucose levels of 55 mg/dL while those individuals (n=10) fed a high protein (50%)/ low carbohydrate diet had glucose levels below the detection threshold. These data indicate that the level of glucose in the coelomic fluid is directly related to the carbohydrate content of the food consumed. The fate of the glucose is not known, but we suggest that the glucose is incorporated into polymers such as glycogen, particularly in the nutritive phagocytes of the gonadal tissues. Supported in part by Mississippi-Alabama Sea Grant.

EVALUATION OF SEDIMENT-SENSITIVE BIOTIC INDICES. Janna S. Owens, Dept. of Biology, Univ. of Ala., Birmingham, AL. 35294. Ken R. Marion and Robert A. Angus.

The Cahaba River, located in the Birmingham, Alabama area, has experienced an escalation in urbanization and the associated sedimentation in its drainage basin. Water quality analyses were conducted by periodic survey, with a particular emphasis placed on the evaluation of sedimentation and its effects on two small mainstream sites of the Cahaba River and five of its tributaries. EPA Rapid Bioassessment Protocol procedures were employed for riffle collections of benthic macroinvertebrates during the spring, summer and fall of 1999-2000. Two hundred randomly-selected organisms per site for each season were then identified to genus level and analyzed by a series of community metrics. As per EPA protocol, several indicators of sedimentation loads were evaluated at each site, including sediment depth and embeddedness. Results indicate significant correlations ($p < 0.05$) between sediment depth, drainage basin alteration and EPA habitat scores. Several macroinvertebrate metrics, such as the EPT (Ephemeroptera, Plecoptera, Trichoptera) Index, the Hilsenhoff Biotic Index and the ratio of Hydropsychidae to total Trichoptera appear to have great sensitivity as indicators of community changes due to the impact of increasing sediment loads. The future requirements of watershed management and control of non-point source pollutants, such as sedimentation, will necessitate further evaluation of established metrics for specific sensitivities.

TISSUE- AND SEX-SPECIFIC DISTRIBUTION OF ESTROGEN RECEPTORS-ALPHA AND -BETA IN TILAPIA *OREOCHROMIS NILOTICUS*. Melody G. Duvall, Stephen A. Watts, Dept. of Biology, and Coral A. Lamartiniere, Dept. of Pharmacology and Toxicology, Univ. of Ala. at Birmingham, AL 35294-0019.

Studies suggest that estrogens regulate various physiological and developmental processes in tilapia. Recently, estrogen receptors-α and -β have been sequenced and cloned from the ovary of *O. niloticus*. Using reverse transcription-polymerase chain reaction (RT-PCR) we determined that both subtypes are expressed in the brain, skin, kidney, gill, testis and ovary. ER-α mRNA transcripts were substantially higher than ER-β in all tissues except gill. This trend was particularly evident in the brain, with a ratio of ER-α to ER-β mRNA of *ca*. 22. This is the first demonstration of estrogen receptor expression in gonadal tissues of tilapia, indicating that these tissues are targets for estrogen action. The presence of these receptors in gonadal tissues further suggests a mechanism of action for the reported effects of estrogens and estrogen mimics on sex determination and sex reversal during early development. The substantial presence of receptors in the skin is of interest and warrants further investigation. We suggest that this tissue may be a target for steroidal pheromones used during social interactions, and could be affected by environmental estrogens. Supported by the Alabama Academy of Science and NIH R01-CA 61742-07 (CAL).

COMPOSITION OF THE DIET OF THE ALABAMA REDBELLY TURTLE (*PSUEDEMYS ALABAMENSIS*). William M. Turner and David H. Nelson, Biology Dept., Univ. of South Alabama, Mobile, AL 36688.

The diet of the Alabama Redbelly turtle was examined using a modified stomach wash. The technique was attempted on 203 turtles, but was successful for only 80 specimens. Data were collected from 7 males and 63 females captured in Baldwin county, AL. Gravid females were observed as early as May 29, which was the start of trapping, but no later than Aug 30. Trapping was conducted for a total of 9 months over two years. Traps were set out in late May for both the 1999 and 2000 trapping seasons. The 1999 trapping season was conducted until Oct. 15th. During the 2000 season, trapping ceased at the end of Sept. Turtles were collected from three areas: Gravine Island (57 females, 6 males), Causeway (9 females, 1 male) section of Hwy 98, and Weeks Bay (7 females). The diets consisted primarily of submerged aquatic vegetation, although the remains of blue crabs and fiddler crabs were infrequently encountered. Dietary composition varied with respect to area but not sex. *Hydrilla verticillata* was the most prevalent species, which contributed the greatest biomass to the diets of Alabama Redbelly turtles captured at the Gravine Island site, but *Najas guadalupensis*, and *Vallisneria americana* dominated the diets of the turtles captured at the Causeway and Weeks Bay sites. *Hydrilla verticillata* is a non-native plant first reported in Baldwin County in 1991, which has since spread throughout the Mobile-Tensaw delta. *Najas guadalupensis* and *Vallisneria americana* are native plants common throughout the lower Mobile-Tensaw delta. The Alabama Department of Conservation and Natural Resources funded this project.

EFFECTS OF STARVATION ON EGG PRODUCTION IN THE CRAYFISH *PROCAMBARUS CLARKII* AND *P. ZONANGULUS*. Mickie L. Powell and Stephen A. Watts, Dept. of Biology, Univ. of Alabama at Birmingham, B'ham, AL 35294.

The crayfish *Procambrus clarkii* and *P. zonangulus* occupy extensive ranges throughout North America where they experience changes in nutrient availability and temperature. Their ranges overlap in the southeastern United States and species composition in ponds is highly variable and difficult to predict. In this region environmental factors result in a period of presumed starvation that coincides with the reproductive cycle. This period of starvation could affect egg production and recruitment, resulting in differential abundance of species in the ponds. We examined the time of egg extrusion and number of eggs extruded in *P. clarkii* and *P. zonangulus* during a five-month starvation period. Starvation delayed the time of peak egg extrusion by approximately two weeks in both species as compared to the fed controls. In *P. clarkii* starvation resulted in a significant increase (p=0.01) in the number of eggs extruded (430 eggs per individual) as compared to the fed controls (340 eggs per individual). Starvation had no effect on the number of eggs extruded by *P. zonangulus*. The increase in egg number in *P. clarkii* may result in greater recruitment of *P. clarkii* juveniles into the population the following season and, as a consequence, influence species composition in ponds. Supported by the Alabama Academy of Science.

Fluctuating asymmetry and sexual selection in the dark-winged damselfly *Calopteryx maculata*. Michelle L. Beck and Stephen Pruett-Jones ; Biological Sciences, Auburn University, AL.

Fluctuating asymmetry refers to random deviations from perfect symmetry and is a measure of developmental instability. As such, it serves as an indicator of individual quality and is a cue used by females in a number of taxa when selecting a mate. We examined fluctuating asymmetry as it relates to morphology, survivorship, and reproductive success in the dark-winged damselfly *Calopteryx maculata*. Fluctuating asymmetry was not correlated with any aspect of morphology in males or females, or with relative survivorship of males. Fluctuating asymmetry did, however, predict mating status in males. Mating males had significantly more symmetrical wings than did non-mating males holding adjacent territories. This finding is likely the result of a relationship between wing symmetry and the male's ability to acquire and hold a high quality territory.

DIETARY PROTEIN INFLUENCES BODY COMPONENTS DURING GROWTH IN THE SEA URCHIN *LYTECHINUS VARIEGATUS*. Brenda D. Wallace, H.S. Hammer, S.A. Watts, Department of Biology, Univ. of Ala. at Birmingham, Birmingham, AL 35294. J.M. Lawrence, Dept. of Biology, Univ. S. Florida, Tampa, FL 33620. A.L. Lawrence, Texas A&M, Port Aransas, TX 78373.

Lytechinus variegatus is a viable candidate for aquaculture. Nutritional requirements for this species have not been determined, particularly in juveniles. Juveniles (ca. 14 mm in diameter) were fed *ad libitum* one of four isocaloric diets varying in protein concentration (14, 23, 32, or 50%) for 14 weeks. Individuals fed the 14% protein diet were significantly smaller in diameter and mass. Little difference in test or spine morphology was observed among the diet treatments. Lantern mass increased with diameter; however, dietary protein did not affect the relative size of the lantern in relation to test dry mass. Dry lantern mass, relative to the test dry mass, was smaller in individuals fed the prepared diets than in individuals consuming a limited algal biofilm, suggesting that food abundance affects lantern size. The gonad index was similar in individuals fed 23-50% protein, however, survivorship decreased in individuals fed the 14 and 23% protein diets. Surprisingly, the total gut (g dry mass) and gut index (g dry mass/ g test dry mass) were directly proportional to the concentration of protein in the diet, increasing by ca. 325% and 60%, respectively. Previous reports found that the quantity of food affects gut mass and morphology. Correspondingly, these data show that both quality and quantity of the diet determine resource allocation to the gut tissues. Dietary protein greater than 23% is required for maximal growth and survival in juvenile sea urchins. Funded by Mississippi-Alabama Sea Grant.

DIET AFFECTS GONAD DEVELOPMENT IN FEMALE JUVENILE SEA URCHINS (*LYTECHINUS VARIEGATUS*) A.W. Cunningham, B.D. Wallace and S.A. Watts, Dept. of Biology, Univ. of Ala., Birmingham, AL 35294. J.M. Lawrence, Dept. of Biology, Univ. S. Florida, Tampa, 33620. A.L. Lawrence, Texas A&M, Port Aransas, TX 78373.

Lytechinus variegatus is a viable candidate for aquaculture of sea urchin roe, a gourmet food. Understanding nutritional factors that promote gonad production will optimize commercial culture. Previous studies have indicated that individuals fed a prepared diet produced gonads at smaller diameters than reported in field populations. Juvenile *L. variegatus* (14 mm diameter, n=30) were fed *ad libitum* one of four isocaloric diets containing 14, 23, 32, or 50 % protein. All individuals in the study demonstrated precocious gonadal development. For individuals fed the 14% protein diet, gonad index was significantly lower than in individuals fed higher concentrations of protein. Using image analysis, the percent of germinal epithelium and nutritive phagocytes and long diameters of oocytes were measured from H&E prepared slides of gonad tissue. Protein concentration did not significantly affect the relative volumes of the germinal epithelium or nutritive phagocytes; however, the majority of the gonad was composed of nutritive phagocytes, not gametes, in all diets. There was an apparent direct relationship between protein concentration and the frequency distribution of egg diameters; those individuals that consumed 14 % protein diet produced significantly smaller oocytes. Qualitative analysis suggests that an additional cohort of eggs is produced in individuals fed the 50 % protein diet. Funded by Miss-Ala Sea Grant.

PHARMACOLOGICAL STUDIES EXAMINING THE EFFECTS OF CHOLINERGIC AGENTS ON THE EMBRYONIC CHICK PANCREAS. Lydell Collier and A. D. Johnson, Department of Biological Sciences, University of Alabama in Huntsville, Huntsville, Alabama 35899. J. U. Johnson, Department of Food and Animal Sciences, Alabama A & M University, Normal, Alabama 35762.

Avian carbohydrate metabolism is regulated by a multifaceted of neural, nutrient and hormonal components. The pancreaticoduodenal nerve plexus supplies the exocrine portion of the avian pancreas. An embryonic whole organ culture system has been developed to determine whether the muscarinic receptor for the chick pancreatic cells is functionally similar to the mammalian muscarinic receptors. Pharmacological levels of synthetic muscarinic agonists and antagonists have demonstrated the regulatory role of the muscarinic receptors for the embryonic chick exocrine pancreas. Through immunohistochemical studies in our lab we have localized amylolytic enzymes in the chick embryonic pancreas. In addition, cryosectioning and indirect immunofluorescent techniques will be used to determine muscarinic (M3) receptor subtype specificity in the embryonic chick pancreas. These studies will be important for understanding neural regulation of the exocrine pancreas and will examine the differences between avian and mammalian carbohydrate metabolism.

NESTLING GROWTH IN THE HOUSE FINCH: TRENDS IN RELATION TO HATCH ORDER AND SEX.

Anne Dervan, Alex Badyaev, and Geoff Hill, Dept. of Biological Sciences, Auburn University, Auburn, AL 36849.

Hatch order and sex are two potential factors that could influence nestling growth. In many bird species, hatch order can have an impact on chick growth if the brood hatches asynchronously. Therefore, earlier-hatched chicks might grow in better environments than later-hatched chicks because they have a competitive advantage. The sex of the chicks could also affect the way a nestling grows, especially in species with adult sexual size dimorphism. Additionally, there is evidence in some species that the sexes differ in their sensitivity to environmental conditions. Since hatch order may have an impact on the environment in which a chick is raised, there is a possibility of an interaction between the sex and hatch order on the growth of the chicks. Because the way an individual grows can affect its ability to survive and reproduce, the impact of hatch order, sex, or an interaction between the two on growth can have important implications for many evolutionary theories. Therefore, I monitored the portion of postnatal growth of House Finches that occurred in the nest by routinely measuring seven morphological traits. I will report on the impact of hatch order, sex, or an interaction between the two on the growth, asymptotic size, or condition of House Finch chicks at fledging, and I will discuss the implications of my findings for several evolutionary theories.

CUES TO OPTIMAL FORAGING BY A CENTRAL-PLACE FORAGER: THE EASTERN CHIPMUNK, *TAMIAS STRIATUS*.

James E. Morris and Robert S. Lishak, Dept. of Biological Sciences, Auburn University, AL 36849

There has been much research done showing that foraging animals optimize their behavior to maximize their energetic returns. However, little research has sought to describe which specific cues a forager uses to alter its behavior for energetic optimization. Three specific variables were examined over the study period: microhabitat, food patch quality, and distance. Foraging was measured as giving-up density (GUD) using a wooden tray filled with a variable sand and seed mixture. Preliminary results involving nine individual chipmunks indicated a statistically significant multiple regression analysis, supporting past findings that an energetic optimization of foraging is occurring. The specific foraging cues were further analyzed individually. Microhabitat's relationship to GUD was in the expected direction, which is best described as a cue of predation risk. Food patch quality was statistically significant as the strongest cue to energetic return from a foraging bout. Correlation between distance and GUD was not statistically significant. Additional analyses indicated that the date of data collection (late spring through early fall) and GUD were positively correlated. A possible explanation of this finding is that the abundance of food resources becomes progressively sparse as fall approaches. As food resources are depleted over time, food sites at a greater distance may be more valuable. The decreasing availability of resources through the study period may necessitate more complete foraging at greater distances. Therefore, microhabitat and food patch quality in this study are statistically significant cues for energetic optimization, while the influence of distance may depend on the time of data collection.

BIODIVERSITY OF THE FRESHWATER TURTLE COMMUNITY IN THE WEEKS BAY WATERSHED. <u>Krista K. van Amerongen</u> and David H. Nelson, Department of Biological Sciences, University of South Alabama, Mobile, AL 36688.

Adjacent to the Mobile Bay, the Weeks Bay estuary provides a rich variety of aquatic habitats for resident turtle species. This project concentrates on assessing the biodiversity of the freshwater turtle community and estimating the relative densities of each species. Trapping extended from May 28 to September 25 (1999) and from March 1 to August 4 (2000). Turtles were collected using 8 sets of aquatic hoop traps. Captured turtles were identified to species, sexed, and weighed; seven different shell measurements were also recorded. Turtles were marked by drilling a pattern of holes in the marginal scutes of the carapace. Each turtle received a unique number that allowed identification upon recapture. There were a total of 1021 turtles captured, with *Pseudemys concinna* (River cooters) accounting for 58% of the community. *Pseudemys floridana* (Florida cooters) made up 17%, and the endangered *Pseudemys alabamensis* (Alabama redbelly turtles) made up 20% of the community. The remaining 5% consisted of *Deirochelys reticularia* (Chicken turtles), *Apalone spinifera* (Spiny softshell turtles), *Chelydra serpentina* (Common snapping turtles), and *Macroclemmys temminickii* (Alligator snapping turtles). A total of 237 turtles representing six different species were recaptured. Three turtle species had significant recapture rates: *P. alabamensis* (14%), *P. concinna* (26.5%), and *P. floridana* (21%). The National Oceanic and Atmospheric Administration funded this project.

PRELIMINARY INVESTIGATIONS OF THE FLORAL VISITORS OF *DALEA PINNATA* (J. F. GMEL.) BARNEBY (FABACEAE) IN SOUTHERN ALABAMA. <u>Todd Clardy</u>, Alvin R. Diamond Jr., Danice H. Costes, and Daryl Richburg. Dept. of Biological and Environmental Sciences. Troy State University, Troy, AL 36082.

Understanding the pollination ecology of native species is important for their preservation and propagation. The pollination ecology of *Dalea pinnata* (J. F. Gmel.) Barneby (Fabaceae) was studied using an insect exclusion technique. Prior to floral maturity, inflorescences were "bagged" with nylon cloth to prevent potential pollinator access. During the flowering period, plants were monitored at various times during the day. Monitored populations were located in Conecuh, Crenshaw, and Pike counties. All insect visitors were collected and identified. In the laboratory, with the aid of a dissecting microscope, the amount of pollen and its placement on each insect was quantified to determine primary pollinators. Of the six insect orders collected, Hymenoptera represented 58% and Diptera 26% of the total. The four largest families were Apidae (17%), Sphecidae (17%), Tephritidae (15%) and Scoliidae (11%). Pollen data suggests that all of these families except the Tephritidae, which had little or no pollen on them, are potential primary pollinators. Viable seed production on the "bagged" inflorescences suggests that *Dalea pinnata* is capable of self-pollination.

CHEMISTRY

ALGAE NATURAL PRODUCTS FOR FORMULATIONS OF NONTOXIC ANTICORROSIVE MARINE COATINGS. Khaled A. Aamer, Nicole Swinson, and Adriane G. Ludwick, Chemistry Department, and Heshmat Aglan, Mechanical Engineering Department, Tuskegee University, Tuskegee, AL 36088.

Fouling organisms such as barnacles, mussels and algae cling to the hulls of ships, resulting in biocorrosion of the hulls. Organic coatings are applied to the hulls to provide protection against the accumulation of fouling organisms and hence from biocorrosion. Protection increases with the use of toxic additives such as copper compounds or tributyltin in the organic coatings. To protect the environment against pollution resulting from the leaching of toxic organic or organometallic compounds, much research is being performed to develop formulations of nontoxic anticorrosive marine coatings containing natural products. In this work, a fouling organism, blue green algae mainly Ulva Lactuca, is being studied to determine if they contain anticorrosive natural compounds. The algae were extracted to give four fractions of different solvent polarities. The hexane isolated fraction of the algae extract revealed the presence of six major compounds based on GC-MS analysis results. The remaining fractions are currently being analyzed. Oxygen, nitrogen, and sulfur containing organic compounds are of special interest because of their anticorrosive nature. Sulfur was detected as a major component from ICP-OES analysis of digested algae. The presence of organic natural compounds containing sulfur was confirmed from ICP-OES analysis of algae extract from methyl isobutyl ketone as the extracting solvent. Steel panels were coated with a vinyl chloride copolymer containing various amounts of algae extracts. Corrosion tests were performed on these panels by immersion in aqueous sodium chloride solution. Based on visual inspection and SEM micrographs, the coated steel panels with algae extract containing coating showed considerable corrosion protection compared to a control. (Supported by USAID/Supreme Council of Universities, Egypt, Linkage Grant 93/02/17.)

IS IT POSSIBLE TO OBSERVE THE OH+HE VAN DER WAALS COMPEX EXPERIMENTALLY?

R.Kim and U.Schnupf, Department of Chemistry, Troy State University, Troy, Alabama 36082.

Over the last decade there has been a considerable experimental and theoretical interest in the open shell Van der Waals complex of rare gas atoms with the diatomic free OH radical. To date, spectra for the triatomic complexes OH(X, A)-Ne, OH(X, A)-Ar and OH(X, A)-Kr have been reported. Until now, no experimental results have been reported for the OH-He complex.
The purpose of our investigation was to generate an accurate *Ab Initio* potential energy surfaces for the OH(X, A)+He reaction in the Van der Waals interaction region. The two-dimensional potential energy surfaces are based on CEPA calculations by Werner et. al. for a fixed vibrationally averaged OH bond distance utilizing a large Dunning basis set. The potential surfaces were then used in ro-vibrational calculations to predict bond-states for the Van der Waals system. In addition, the potential energy surface features are compared to recently reported *Ab Initio* calculations for similar systems.

NOVEL POLYAMINEQUINONES FOR MARINE COATINGS: ANALYSIS AND APPLICATION.

M. E. Hoque, K. King and A. G. Ludwick, Department of Chemistry, Tuskegee University, Tuskegee, AL-36088.

A family of polymers, polyaminequinone (PAQ), containing the 2,5-diamino-1,4-benzoquinone functional group, has been of interest for more than 13 years due to its ability to protect metal against corrosion. It is reported that the PAQ from Jeffamine D-400 (polyoxypropylenediamine) and p-benzoquinone showed adequate properties to be used in coating formulations as a binder and anti-corrosive agent. In an attempt to rationalize the anti-corrosion mechanism for the PAQ system, simpler diamines than Jeffamine D-400 have been explored to synthesize new PAQ polymers. Five novel PAQ polymers have been synthesized from p-benzoquinone and monosubstituted p-benzoquinone such as methyl-p-benzoquinone and phenyl-p-benzoquinone and aliphatic diamines such as 2-butyl-2-ethyl-1,5-pentanediamine, 1,4-bis(3-aminopropoxy)butane and 1,2-bis(2-amino ethoxy)ethane using methylene chloride as solvent. The synthesized PAQ polymers have been characterized by UV-Vis, IR and NMR analyses. Among these new PAQs, the polymer prepared from phenyl-p-benzoquinone and 2-butyl-2-ethyl-1,5-pentanediamine had demonstrated good solubility in common organic solvents such as acetone, methylene chloride, methanol, tetrahydrofuran, methyl isobutyl ketone, dimethylsulfoxide, and dimethylformamide. The coating prepared from the soluble PAQ polymer, phenyl-p-benzoquinone-2-butyl-2-ethyl-1,5-pentanediamine polymer showed good adhesion to a metal surface after curing, good corrosion resistance in artificial sea water and did not form any blisters. This preliminary study indicates that it is a better coating than the comparable PAQ from Jeffamine D-400.

TITRATION PRECISION ESTIMATES BY MONTE CARLO METHOD. <u>B. U. Lambert</u> and M. B. Moeller, Department of Chemistry and Industrial Hygiene, University of North Alabama, Florence, AL 35632.

The precision to be expected from three different methods for determining the equivalence point in a volumetric boric acid-sodium hydroxide titration were examined by Monte Calro simulation. The three methods considered were the conductimetric method, a variation of this method for dilute systems, and the Schwartz method. Titrations with normal scatter introduced into the pH measurements, the conductivity readings and the titre volume were simulated using Excel spreadsheets and a Visual Basic Macro. The model included the effects of changing activity and the autoionization of water. The simulations had ten data points taken before the true equivalence point of 34.10 mL and ten points measured after the equivalence point. The average experimental equivalence points and standard deviations for each of the three analytical techniques were calculated from sets of 100 simulated titrations. Three sets of simulations were performed to observe the stability in the results. Effects of varying the incremental volumes of titre from 0.1 mL to 2.0 mL were studied. The simulations indicated that the most accurate and precise values are achieved by the Schwartz method. For the experimental conditions of the simulations, the best values occurred using 0.2-mL increments of titre. For the range studied, however, the Schwartz method appears to be relatively insensitive to the size of the titre increment.

$T_{1\rho}$ RELAXATION STUDIES OF METHYLALUMINOXANE. <u>Amy Campbell</u>, Department of Chemistry and Industrial Hygiene, University of North Alabama, Florence, AL 35632. Anthony A. Mrse and Leslie G. Butler, Department of Chemistry, Louisiana State University, Baton Rouge, LA 70803.

One proposed structure of methylaluminoxane (MAO), a polypropylene co-catalyst, contains two types of methyl groups, one bridging and one terminal. The possibility of two types of methyl groups existing in MAO has been explored by solid-state ^1H Nuclear Magnetic Resonance (NMR) $T_{1\rho}$ relaxation time data. A significant difference in the $T_{1\rho}$ values would indicate that the two types of methyl groups exist. $T_{1\rho}$ relaxation time data were collected as a function of B_1 field strength and as a function of temperature on two slightly different samples of MAO: MAO solid and MAO gel. MAO gel, while similar to MAO solid, is believed to have more chemical bonds between major MAO structural units; some of those bonds may prove to be bridging methyl gropus. Data analysis was performed using a Mathematica least squares analysis which was calculated using double exponential fits. This yielded the $T_{1\rho}$ values and compositions. Activation energies for MAO were then obtained by fitting the $T_{1\rho}$ data as a function of temperature. The activation energy for the bridging methyl group could not be reliably measured, probably due to a distribution of strength of bridge bonding. The measurement as a function of B_1 strength were designed to assess the range of bridge bonding strengths. This work has practical applications in industry. A major abjective is to help in development of process control technology for the industrial synthesis of MAO.

IS IT POSSIBLE TO OBSERVE THE OH+HE VAN DER WAALS COMPEX EXPERIMENTALLY?

R.Kim and U.Schnupf, Department of Chemistry, Troy State University, Troy, Alabama 36082.

Over the last decade there has been a considerable experimental and theoretical interest in the open shell Van der Waals complex of rare gas atoms with the diatomic free OH radical. To date, spectra for the triatomic complexes OH(X, A)-Ne, OH(X, A)-Ar and OH(X, A)-Kr have been reported. Until now, no experimental results have been reported for the OH-He complex.
The purpose of our investigation was to generate an accurate *Ab Initio* potential energy surfaces for the OH(X, A)+He reaction in the Van der Waals interaction region. The two-dimensional potential energy surfaces are based on CEPA calculations by Werner et. al. for a fixed vibrationally averaged OH bond distance utilizing a large Dunning basis set. The potential surfaces were then used in ro-vibrational calculations to predict bond-states for the Van der Waals system. In addition, the potential energy surface features are compared to recently reported *Ab Initio* calculations for similar systems.

PRECURSOR POLYMER APPROACH TOWARDS THE SYNTHESIS OF CONJUGATED POLYMERS: ELECTROPOLYMERIZATION OF POLYMETHYLSILOXANES WITH PYRROLE.

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We report our recent results on the formation and electrodeposition of conjugated polymer films by a novel electrochemical approach consisting of: 1) Synthesis of specialized precursor soluble polymers 2) Electro-deposition of films from these polymers on conducting substrates. This involves molecularly ordered cross-linked and network "precursor" polymer systems primarily demonstrated in polyfluorenes. The synthesis of polymers containing electroactive pyrrole monomeric units on polymethylsiloxane backbone was undertaken. These polymers are characterized by low Tg's and high flexibility. We have investigated the monomer and polymer formation by NMR, UV-vis, DSC, SEC analysis. The polymer was electrodeposited subsequently on the surface and monitored by cyclic voltammetry. Our results indicate that the overall optical and mechanical quality of the films is superior compared to previously reported systems. The electropolymerization process is dependent on the concentration of the precursor polymer in solution. We have made various composition ratios of precursor polymer and monomer and investigated the relationship with the morphology and doping properties of the film. This new approach will eventually allow us to fabricate patterned devices with conducting polymers without using conventional spin casting and photolithographic techniques.

A COMPUTATIONAL STUDY OF p-N,N-DIMETHYLAMINOCINNALDEHYDE.

Steven E. Arnold and Bryan Hutto, Department of Physical Sciences, Auburn University Montgomery, Montgomery, AL 36124

The properties of highly polar aromatic compounds are of interest due to the usefulness of such compounds in a variety of applications such as polarity probes and as potential nonlinear optical materials. The optimized geometry of p-N,N-dimethylaminocinnamaldehyde was calculated at the HF 6-31+G(d) level. The optimized geometry is planar except for pyramidalization of the amino nitrogen. Electronic transitions from the ground state geometry were computed by the ZINDO semiempirical method. The computed transitions are compared with experimental spectra. This research was partially supported by a grant from the Auburn University Montgomery Research Grant-In-Aid Program. A grant of computer time from the Alabama Supercomputer Center is also hereby acknowledged.

$T_{1\rho}$ RELAXATION STUDIES OF METHYLALUMINOXANE.

Amy Campbell[1], Anthony A. Mrse[2], Leslie G. Butler[2], Department of Chemistry, University of North Alabama[1], Florence, AL 35632, Louisiana State University[2], Baton Rouge, LA 70803

ABSTRACT

One proposed structure of methylaluminoxane (MAO), a polypropylene co-catalyst, contains two types of methyl groups, one bridging and one terminal. The possibility of two types of methyl groups existing in MAO has been explored by solid-state [1]H Nuclear Magnetic Resonance (NMR) $T_{1\rho}$ relaxation time data. A significant difference in $T_{1\rho}$ values would indicate that the two types of methyl groups exist. $T_{1\rho}$ relaxation time data were collected as a function of B_1 field strength and as a function of temperature on two slightly different samples of MAO: MAO solid and MAO gel. MAO gel, while similar to MAO, is believed to have more chemical bonds between major MAO structural units; some of those bonds may prove to be bridging methyl groups. Data analysis was performed using a Mathematica least square analysis which was calculated using double exponential fits. This yielded the $T_{1\rho}$ values and compositions. Activation energies for MAO were then obtained by fitting the $T_{1\rho}$ data as a function of temperature. The activation energy for the bridging methyl group could not be reliably measured, probably due to a distribution of strength of bridge bonding. The measurements as a function of B_1 strength were designed to assess the range of bridge bonding strengths.

This work has practical applications in the industry. A major objective is to help in development of process control technology for the industrial synthesis of MAO.

NOVEL POLYAMINEQUINONES FOR MARINE COATINGS: ANALYSIS AND APPLICATION. M. E. Hoque, K. King and A. G. Ludwick, Department of Chemistry, Tuskegee University, Tuskegee, AL-36088.

A family of polymers, polyaminequinone (PAQ), containing the 2,5-diamino-1,4-benzoquinone functional group, has been of interest for more than 13 years due to its ability to protect metal against corrosion. It is reported that the PAQ from Jeffamine D-400 (polyoxypropylenediamine) and p-benzoquinone showed adequate properties to be used in coating formulations as a binder and anti-corrosive agent. In an attempt to rationalize the anti-corrosion mechanism for the PAQ system, simpler diamines than Jeffamine D-400 have been explored to synthesize new PAQ polymers. Five novel PAQ polymers have been synthesized from p-benzoquinone and monosubstituted p-benzoquinone such as methyl-p-benzoquinone and phenyl-p-benzoquinone and aliphatic diamines such as 2-butyl-2-ethyl-1,5-pentanediamine, 1,4-bis(3-aminopropoxy)butane and 1,2-bis(2-amino ethoxy)ethane using methylene chloride as solvent. The synthesized PAQ polymers have been characterized by UV-Vis, IR and NMR analyses. Among these new PAQs, the polymer prepared from phenyl-p-benzoquinone and 2-butyl-2-ethyl-1,5-pentanediamine had demonstrated good solubility in common organic solvents such as acetone, methylene chloride, methanol, tetrahydrofuran, methyl isobutyl ketone, dimethylsulfoxide, and dimethylformamide. The coating prepared from the soluble PAQ polymer, phenyl-p-benzoquinone-2-butyl-2-ethyl-1,5-pentanediamine polymer showed good adhesion to a metal surface after curing, good corrosion resistance in artificial sea water and did not form any blisters. This preliminary study indicates that it is a better coating than the comparable PAQ from Jeffamine D-400.

UV-VISIBLE ABSORPTION SPECTROSCOPY OF p-N,N-DIMETHYLAMINOCINNAMALDEHYDE. Michael Pyrlik and Steven E. Arnold, Department of Physical Sciences, Auburn University Montgomery, Montgomery, AL 36124

The properties of highly polar aromatic compounds are of interest due to the usefulness of such compounds in a variety of applications such as polarity probes and as potential nonlinear optical materials. The low energy transisions in the UV-visible absorption spectra of p-N,N-dimethylaminocinnamaldehyde are found to be highly sensitive to solvent polarity. In addition, the transition energies are found to be dependent on the hydrogen bond donating strength of the solvents. This research was partially supported by a grant from the Auburn University Montgomery Research Grant-In-Aid Program.

THE PRECURSOR POLYMER APPROACH TOWARDS THE SYNTHESIS OF CONJUGATED POLYMERS: ELECTROPOLYMERIZATION OF POLYMETHYLMETHACRYLATE (PMMA) FUNCTIONALIZED WITH PYRROLE

Suxiang Deng and Rigoberto Advincula
Department of Chemistry, University of Alabama at Birmingham
Birmingham, AL 35294-1240

We report our recent results on the formation and electrodeposition of conjugated polymer films by a novel electrochemical approach consisting of: 1) Synthesis of specialized precursor soluble polymers 2) Electro-deposition of films from these polymers on conducting substrates. This involves molecularly ordered cross-linked and network "precursor" polymer systems primarily demonstrated in polyfluorenes. The synthesis of polymers containing electroactive pyrrole monomeric units on polymethylmethacrylate (PMMA) was undertaken. We have investigated the monomer and polymer formation by NMR, UV-vis, DSC, SEC analysis. The polymer was electrodeposited subsequently on the surface and monitored by cyclic voltammetry. Our results indicate that the overall optical and mechanical quality of the films is superior compared to previously reported systems. We have made various composition ratios of precursor polymer and monomer and investigated the relationship with the morphology and doping properties of the film. This new approach will eventually allow us to fabricate patterned devices with conducting polymers without using conventional spin casting and photolithographic techniques.

AB INITIO POTENTIAL ENERGY SURFACE FOR THE INTERACTION BETWEEN H_2 AND CN.

U.Schnupf, Department of Chemistry, Troy State University, Troy, Alabama 36082. K.Morokuma and M.C.Heaven, Department of Chemistry and Cherry L. Emerson Center for Scientific Computation, Emory University, Atlanta, Georgia 30322

There has been considerable recent experimental interest in van der Waals complexes formed between open and closed shell diatoms. In the case of the CN-H_2 spectra have been recorded for the ground and excited state for CN by Chen *et al.* Previous calculations show that CN+H_2 in its electronic ground state is collinear minima and there is barrier to the forward reaction proceeding via a linear transition state. Until now no similar information was available for the CN-H_2 in its electronic excited state. The purpose of our investigation was to generate an accurate *Ab Initio* potential energy surface for the CN(A $^2\Pi$)+H_2 reaction in the Van der Waals interaction region. A new four-dimensional *Ab Initio* potential energy surface will be reported for the long-range interaction of H_2 with the open-shell CN diatomic in the its first electronic state A$^2\Pi$. The multidimensional potential energy surface is based on a second order multireference perturbation calculation (CASPT2) by Werner for a fixed vibrationally averaged CN and H_2 bond distances utilizing a large Dunning basis set. The potential surface features are compared with experimental spectrum reported earlier by Chen *et al.* In addition, the potential energy surface is compared to recently reported *Ab Initio* calculations for H_2+O_2.

EARTH SCIENCE

ANALYTIC ELEMENT MODELING OF GROUNDWATER FLOW IN THE WADENA AREA, CENTRAL MINNESOTA. Daniel J. O'Donnell, PG, O'Donnell & Associates, Inc., One Office Park, Suite 404D, Mobile, Alabama 36609

The Analytic Element Method (AEM) of groundwater modeling was used to generate a steady state potentiometric surface map of the water-table aquifer in the Wadena area of Central Minnesota. The water-table aquifer in the Wadena area was the subject of an extensive study by the United States Geological Survey in the late 1960s. During the study, 150+ borings were drilled to define the subsurface geology of the aquifer and to obtain water level data used in the construction of a regional potentiometric surface map of the aquifer. The regional potentiometric surface map generated from comprehensive field data indicated groundwater mounding between area streams with overall groundwater flow toward the northeast and local groundwater flow patterns influenced by adjacent streams. Both the public domain WellHead Analytic Element Method (WhAEM) code and the commercial AEM code GFLOW 2000 were used to generate regional potentiometric surface maps of the Wadena area. Combining analytic elements that represent hydrogeologic features in the area with known geologic and hydraulic properties of the aquifer, both models generated potentiometric surface maps with flow patterns in agreement with the potentiometric surface map presented in the USGS study. The AEM models were then used to delineate time-of-travel wellhead protection areas for two public water supply wells operated by the City of Verndale. AEM models can be valuable tools on groundwater projects in similar hydrogeologic setting with less than ideal field data.

RECHARGE CHARACTERISTICS OF AQUIFERS IN THE NE SECTION OF WEST AFRICA. Emmanuel Udoh, Earth Science Program, Physics/Math Department, Troy State University, Troy, AL 36082.

To avoid the miming or overpumping of an aquifer, the determination of the groundwater potential, especially the recharge potential, is essential. In the NE section of West Africa, a semi-arid region, the recharge characteristics of the aquifers were studied using water balance and baseflow techniques. The water balance method gave a composite value for the recharge and evapotranspiration. The results from the baseflow analysis, show the recharge rate to be approximately 4% of the annual precipitation, a defensible value fore a semi-arid region, where evapotranspiration is a dominant output variable. An aerial distribution of a recharge rate was represented on the precipitation isoline map for ease of evaluation. Finally, the groundwater potential of the study area was evaluated based on the recharge rate and the computed draw-down for the whole area amounted to 0.4mm per year.

DELINEATING THE EFFECTS OF LATE PALEOZOIC DEFORMATION OF MIDDLE PALEOZOIC METAMORPHIC ISOGRADS WITH GEOTHERMOBAROMETRY.

David T. Allison, Dept. of Earth Sciences, University of South Alabama, Mobile, AL 36688.

The southern Appalachian Blue Ridge is composed predominantly of late Proterozoic metaclastic and metavolcanic units overprinted by a mid-Paleozoic dynamothermal event that recrystallized these units to a range of metamorphic grades. Because of a combination of appropriate mineral assemblages, and intriguing structural relationships, two regions have been investigated using geothermobarometric and kinematic analysis: (1) the Ashland-Wedowee belt, part of eastern Blue Ridge in Alabama, and (2) the Murphy Belt in north Georgia, a portion of the western Blue Ridge. Metapelitic, metagreywacke, and amphibolite lithologies from both study areas were analyzed with the microprobe for assemblages: Ga+Bi+Pl+Mu, Ga+Hbl+Pl, and Ga+Cpx+Pl. Murphy Belt samples yielded a geothermal gradient 11.5 deg. C per km. A regional Alleghanian antiform deflects region (2) metamorphic isograds and geothermobarometric contours near Tate, GA. The effect is due to the deformation of Acadian isothermal and isobaric surfaces by the antiformal cross-fold, and does not represent a true syn-metamorphic inversion.

Region (1) samples yielded a mean geothermal gradient of 19 deg. C per km. However, field and petrographic evidence indicate both prograde and retrograde subsets that define a PT-time clockwise "loop" that we believe represents an uplift (decompression) event. Folding of metamorphic isograd surfaces above a footwall ramp would account for the observed trends.

EVIDENCE OF STORM AND HUMAN IMPACTS ON ESTUARINE SEDIMENTATION, WEEKS BAY, BALDWIN COUNTY, ALABAMA.

Lauree Stober, Vince Beebe, Doug Haywick and David Allison, Department of Earth Sciences, University of South Alabama, Mobile Al, 36688

Weeks Bay is a small estuary (c. 7 km^2) that is located 30 km south-east of Mobile, Alabama. Three years ago, we initiated a study designed to produce high resolution GIS maps of yearly bottom sediment in the bay. Over 1800 grab samples were collected during the study. Grain size analysis was conducted on the upper 2 cm of each grab.

Our first year of sampling (January, 1998) occurred six months after Hurricane Danny made landfall at Weeks Bay. This event generated a major flood-storm surge that distributed sand from the mouth of the Fish River across much of the middle portion of the bay. Our second year of sampling (January, 1999) took place four months after Hurricane Georges made landfall in southern Mississippi. Although landfall was well to the west, this storm generated a surge that pushed sand from Mobile Bay several hundred meters into Weeks Bay. Our third phase of sampling (January, 2000) followed a relatively quiet year. No major storms or floods affected the area, hence year three data records fair-weather sediment distribution in Weeks Bay. This sediment is dominantly clayey-silt and largely overlies sand deposited during previous storm events. The exception is at the mouth of the Magnolia River where a body of sand has expanded significantly (c. 20%) during fair-weather conditions.

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YANDEV LIMESTONE: A CASE STUDY OF LIMESTONE PURITY.

Emmanuel Udoh, Earth Science Program, Physics/Math Department, Troy State University, Troy, AL 36082.

Thirty samples collected from a quarry in the Yandev Limestone (a member of the ASU River Group) in the middle Benue Trough of West African were analyzed. In this study, a geochemical approach was used to interpret the depositional as well as evaluate the purity of the limestone. The spectroscopic and difractometric (powder and sedimentation) methods showed the limestone to have an average CaC03 content of 92% consisting of calcite as the dominant species and a few thin dolomitic bands. Based on the stratal packages, a differential use of the limestone for the chemical and cement industries could be adopted, rather than its limited current use involving cement manufacture. Diagenetically, the geochemical analysis indicates a cyclic type of the sedimentation during the deposition of the limestone in an epeiric platform.

PRELIMINARY RESULTS OF SHALLOW CORING IN WEEKS BAY, BALDWIN COUNTY, ALABAMA.

Vanessa Junkins, Lee Yokel, John Kempton, & Doug Haywick, Department of Earth Sciences, University of South Alabama, Mobile Al, 36688

Through the use of shallow piston corers, we have successfully collected 12 sediment cores up to 4 m in length from Weeks Bay, a small estuary located in Baldwin County, Alabama. Each core is being examined for variations in mineralogy, grain size and faunal content. To date, three cores have been sub-sampled for grain size and mineralogical variation on a cm-scale. Cores collected proximal to shorelines are dominated by sandy silt and sand. Those collected from central portions of the bay are dominated by silty clay. All cores contain intervals of finer or coarser sediment which we interpret as the results of episodic sedimentation events. In particular, coarser intervals within cores collected from the central part of Weeks Bay are interpreted as sand influxes driven by either storms or flood events.

We have yet to obtain radiometric dates from the cores that we have collected, however, a bottom date collected from a companion core being examined for faunal content yielded a date of approximately 6000 year B.P. (M. Fearn, *pers. comm.*). Sedimentological criteria also lead us to believe that in at least two of our cores (those closest to the present shorelines), we have completely penetrated the Holocene sediment fill of Weeks Bay.

FOSSIL REEFS WITHIN THE BANGOR FORMATION (MISSISSIPPIAN), LAWRENCE COUNTY, ALABAMA.

Doug Haywick, Department of Earth Sciences, University of South Alabama, Mobile Al, 36688 and David Kopaska-Merkel, Geological Survey of Alabama, Tuscaloosa AL, 35486

Frameless reef complexes (carbonate mounds) occur in several isolated outcrops of the Bangor Limestone (Mississippian) in north Alabama. The most impressive is a bryozoan-crinoid-coral mound exposed on State Highway 157 in Lawrence County. The mound is approximately 25 m wide and up to 1.6 m thick. It is dominated by *in situ* colonies of the large rugosan *Caninia* sp. in a matrix of fenestrate bryozoan and echinoderm debris. Rubble horizons containing broken rugose corals that are not in growth position are interpreted as wash over facies that were deposited behind the mound crest during storms.

The mound is underlain by oolitic grainstone. We believe that the oolite acted as a topographic high and that coral growth was preferential initiated here following a brief interval of subaerial exposure that indurated the oolite. Post-mound early diagenesis including calcite cementation and dolomitization was controlled by a second period of subaerial exposure after the mound had become buried beneath peritidal mudstone.

GEOGRAPHY, FORESTRY, CONSERVATION, AND PLANNING

FORESTRY AT AUBURN IN THE TWENTIETH CENTURY. Wilbur B. De Vall, Proxy Services, Ltd., Auburn, AL 36830.

One hundred four years have passed since Forestry became a part of Auburn University. A forestry course was taught in 1897. The void ended in 1926 when four species of Southern Pine were planted on badly-eroded land as a conservation measure. Next, tests of wild fire at yearly intervals to compare with annual burns were begun. In 1935, a professional forester, Donald J. Wadell was employed to teach a general forestry course. In 1945, Act 294 was passed by the Legislature authorizing a professional curriculum and funding for a building. The Dean, School of Agriculture hired Dr. R. H. Westveld to begin planning. He surveyed schools of forestry and in July 1946 hired the first faculty member, Wilbur De Vall. Research work had already started within the Agricultural Experiment Station sponsored by the U. S. Department of Agriculture, Forest Service. The first new building on campus after World War II was the Forestry building dedicated in 1949. Westveld returned to the University of Missouri and was replaced by Dr. T. D. Stevens, who soon returned to Michigan State University. De Vall became Acting and later the third Department Head in January 1950. During this year, the forestry program was accredited by the Society of American Foresters. De Vall served for twenty-six years and was replaced by Dr. Emmett Thompson, who later became Dean of a School of Forestry in 1984. Following his retirement, Dr. Richard Brinker became Dean. Under Brinker's tenure, a School of Forestry and Wildlife Science was approved in 1999. During the period 1950 - 1984. an addition to the original building and a Forest Products Laboratory were constructed. Several advances in the professional areas of teaching, research, and outreach took place prior to the end of the Century.

LAND USE TRENDS IN ALABAMA'S FAST GROWTH COUNTIES:

Chukudi V. Izeogu, Ph.D., Dept of Community Planning and Urban Studies, Alabama A&M University, Normal, AL 35762

Several urban and rural counties in Alabama have witnessed fast population growth and land use change within the past decade. However, scant attention has been paid to the analysis of land use change and its impact on agricultural land in these counties. A longitudinal study of rural land use change, especially agricultural land, from 1982-1997, shows that there is a growing trend of agricultural land loss in many fast growth counties of the state. The amount of land consumed by land development in the state from 1982 to 1997 averaged 993,000 acres. The figure for 1992-1997 was 89,060 acres. The change in land use results mainly from rural land conversion to urban uses. A multiple regression analysis of the relationships between rural (agricultural) land loss as a dependent variable, and the following independent variables: population growth, urban expansion, and income growth in selected north Alabama counties showed a moderate to high correlation. The result of the study suggests the need for regional planning and effective growth management in the fast growth areas where some municipalities are witnessing signs of urban sprawl.

SMALL TOWN NEEDS IN ALABAMA: A YEAR 2001 SURVEY.

Demetris Wells and William K. McAllister. Dept. of Community Planning and Urban Studies. Alabama A & M University. Huntsville, AL

Municipalities falling below their state's median family income and containing less than 3000 residents are sometimes assumed to have similar needs as larger municipalities do. This research focuses on the public needs as perceived by the current mayor of smaller and poorer municipalities in Alabama. The mayors are in the best position to reflect on the town's needs. The research design calls for these scaled results to be compared with Year 2000 Census results captured at the residences, April 1, 2000. Early results show that mayors of these small cities place better roads, more jobs and more youth programs at the top of their lists of need. Solid waste disposal, usually a county responsibility, is judged to be least important. Land use planning and zoning also generated a low interest among the early returns. This research is on-going.

ARTIFICIAL DUNE CONSTRUCTION AT DAUPHIN ISLAND, AL.

Philip L. Chaney, Department of Geology and Geography, Auburn University

In September 1998, storm surge produced by Hurricane Georges overwashed a substantial portion of Dauphin Island, AL. This event caused severe erosion along the south-facing coast of the island and exposed many houses to future danger. The Federal Emergency Management Agency (FEMA) assisted local efforts to protect the infrastructure of the island by funding the construction of an artificial dune along the south-facing coast. The material used to construct the artificial dune was dredged from the north-facing side of the island where sediment had been deposited in the bay during the hurricane event. Removal of this material from the bay may expose the north-facing coast to additional erosion from winter storm events. Furthermore, the artificial dune does not cover the entire section of the south-facing coast where houses are exposed to storm surge. Lastly, no funds were provided for establishing vegetation on the artificial dune to stabilize the structure because FEMA did not intend the structure to be "permanent". In fact, FEMA prefers to call the structure a "Protective Beach Berm" instead of an artificial dune. This paper discusses the construction of the artificial dune/berm and the implications of this action on the coastal environment at Dauphin Island.

WHAT AGENCY DIRECTORS SAY ABOUT THEIR GEOGRAPHIC INFORMATION SYSTEMS.

William K. McAllister, Dept. of Community Planning and Urban Studies, Alabama A & M University, Huntsville, AL.

The ongoing diffusion of geographic information systems (GIS) throughout the world, especially in public planning agencies, has provided an opportunity for researchers to uncover data on a variety of organizational issues relating to the adoption and successful implementation of this spatial analysis technology. Public agencies no longer use this technology solely as an internal tool to produce maps to aid planners make alternative recommendations, as important as this is. External decision-makers and citizens are potential users, aided by planners. This researcher's 1998 census of public planning agencies in Alabama and two neighboring states provided some open-ended responses about advice agency administrators would give to those adopting GIS at a later time. A sample of those responding from Alabama in 1998 were contacted in 2001 to find out whether their advice would be different today. The chief concerns were and are related more to data bases and employee training than to hardware and software issues. At the organizational level, technology-driven changes are emerging in the form of one-stop mapping services and new relationships with stakeholders, built on GIS outputs. Reduced costs and friendlier technology suggest that GIS will not only become a routine analysis tool, but also an instrument to encourage more enlightened public participation.

ORIGIN AND FORMATION OF PROPERTY RIGHTS INTEREST GROUPS IN MISSISSIPPI AND ALABAMA.

Constance J. Wilson, Dept. of Community Planning and Urban Studies, Ala. A&M Univ., Normal, AL 35762.

This research focused on property (land) rights groups in the States of Alabama and Mississippi for an examination of the research questions of (a) To what extent can property rights interest group formation in Alabama and Mississippi be explained in terms of Truman's Disturbance Theory and Salisbury's Exchange Theory? and (b) Did the experience in each state's property rights groups favor a different theory, or was one theory applicable to both, or was a combination of the two theories necessary to explain interest group formation? A qualitative research design was employed comprised of seven methodological steps to develop a case study of the two states' property rights interest communities. For the State of Alabama, three property rights groups were identified. In Mississippi, four groups were documented as advocates for property rights. Associating the information gathered to the propositions of the Disturbance and Exchange Theories, the study found that both theories had some utility for explaining group formation or activation in the study states. The Exchange Theory best explained the formation character of two of the three Alabama groups. The third group's formation information best supported the Disturbance Theory. Mississippi's groups' activation and formation were best explained by sets of propositions under the Disturbance Theory. The 1990s was a heightened period of group activity on the issue of property rights. The issue has carried over into the new century. The continued vigilance to pass property rights legislation at both the state and the national level speaks to the currency and opportunities for other investigative paths.

PHYSICS AND MATHEMATICS

The Free Particle Hamiltonian and Krein's Formula. Non-dense case.

Govind Menon, S Belyi, Troy State University, Troy, Al 36082.

The difference in the resolvents of two self-adjoint extensions of the non-densely defined Hermitian operator $A = -\nabla^2$ (when restricted to an appropriate subspace of $L^2(0, \infty)$) is studied by explicitly constructing a Green's function solution. The deficiency indices of the original operator A are (∞, ∞), while the semi-deficiency spaces are one-dimensional. The coefficient function in Krien's formula and its connection to the generalizations of von Neumann formula are explicitly calculated. A possible application of the theory in the analysis of Quantum Zeno Dynamics will be briefly discussed

PROBABILISTIC AND STATISTICAL STUDY OF THE THREE W'S OF WEST INDIAN CRICKET.

A. Tan, Department of Physics, Alabama A & M University, Normal, AL 35762.

Within the space of 18 months and a radius of 1 mile in the tiny island of Barbados were born three unrelated and dissimilar individuals named Worrell, Weekes and Walcott. Popularly known as "the three Ws", they were destined to become the three leading batsmen in the West Indian Cricket team. The probability that the top three batsmen in the West Indian team would be born in Barbados and would have their surnames begin with W is estimated at 9 in a million. The theoretical probability of all three scoring centuries in the same test innings is 1 in 190; and yet the actual frequency with which this happened is 1 in 25. The batting figures of all three were so similar that debate raged as to who was the greatest batsman among the three. Statistical figures indicate that each was number one during different parts of their careers. But based on their overall numbers, they were almost equal. The correlation between Weekes' and Walcott's numbers was the highest and the between Worrell and Weekes was (relatively) the least. The modes of dismissals of the three showed interesting differences, which reflect their individual batting styles and also their running abilities between the wickets. All three men received the Wisden's award; all three were eventually knighted; and all three were inducted into Cricket's first Hall of Fame. The three Ws symbolized the very team they played for – the West Indies.

THE PROPAGATION OF ONE AND THREE HUNDRED eV POPULATIONS OF PROTONS IN THE EARTH'S MAGNETOSPHERE

B. J. Bateman, Dept. of Mathematics and Physics, Troy State University Troy, Alabama 36082. D.C. Delcourt, Centre d'Etudes des Environments Terrestre et Planétaries, Saint -Maur-des Fossés, France. T.E. Moore and Barbara Giles, Interplanetary Physics Branch, Goddard Space Flight Center, Greenbellt, Md 20771

Two artificial populations of protons, one with a temperature at 1 eV and the other with a temperature of 300 eV were released from various points near the magntopause on the sun side of the Earth. These populations were tracked using a computer code until they reached a plane located 10 Earth radii on the dark side of the Earth. The distributions at this plane were compared.

INITIAL DATA IN GENERAL RELATIVITY. Brian R. Smith, Dept. of Mathematics, University of Ala. at Birmingham, Birmingham AL 35294. Gilbert Weinstein, Dept. of Mathematics, University of Ala. at Birmingham, Birmingham AL 35294.

Initial Data in general relativity consists of a 3 dimensional Riemannian manifold along with an instantaneous time rate of change of this manifold. In addition, the manifold and its rate of change must satisfy the Einstein constraint equations. Using an appropriate gauge, these equations imply that the scalar curvature of the manifold is nonnegative. We have found suitable conditions under which a nonnegative scalar curvature manifold representing an isolated gravitational system can be continuously deformed into another such manifold while maintaining nonnegative scalar curvature along the deformation path. This allows corresponding pieces of initial data to be connected by a continuous path that remains within the class of valid initial data. This is relevant in general relativity since solutions of the full Einstein equations can also be regarded as continuous paths in the space of initial data.

Density and Temperature Measurement of a Microwave Plasma, N. K. Podder, J. A. Johnson III, and E.-D. Mezonlin, Center for Nonlinear & Nonequilibrium Aeroscience, Florida A&M University, Tallahassee, FL32310

A microwave plasma in argon is generated inside a pyrex tube by a 3-kW power supply in combination with a magnetron, wave guide, and a resonant cavity. The gas pressure is varied from 200 to 1800 mTorr, and the microwave output power from 300 to 1200 W. Plasma emission is studied by a monochromator and a photomultiplier tube hooked up to a computer digitizing card, where Ar I lines are identified in the wavelength range from 300 - 500 nm. Plasma parameters are diagnosed by a single Langmuir probe. Bias voltage and current characteristic curves are analyzed for the determination of electron temperature, density, and plasma potential. Electron temperature is found to be in the range 4.2 - 6.2 eV, electron density $1.4 - 7.6 \times 10^{11}$ cm^{-3}, and plasma potential 22.6 - 35.6 Volts.

TRIBOLUMINESCENT MATERIALS FOR OPTICAL DAMAGE SENSORS[*]

T. Gebre, K. Bhat, C. Owens and M.D. Aggarwal, Department of Physics, Alabama A&M University, Normal, AL 35762.

Triboluminescent materials possess the property of fracture induced light emission. A triboluminescent material embedded in, or attached on a composite structure could act as a real time optical damage sensor. The occurrence and severity of the damage is given by the intensity of the resulting triboluminescent light. An array of triboluminescent sensors may allow real time damage location monitoring simply by determining the wavelength of the emitted light. In this paper we have successfully synthesized a triboluminescent material europium tetrakis (Dibenzoylmethide)-triethylammonium. A solution of 2 mmoles of anhydrous europium chloride in 10 ml of ethyl alcohol is added to a hot solution of 8 mmoles of dibenzoylmethane and 8 mmoles of triethylamine in 60 ml of absolute ethyl alcohol. The mixture is allowed to cool and crystals are collected by filtration under suction. This material shows intense triboluminescent properties and showed an emission peak at 620 nm using a slit width of 250 μm. This material can possibly be used in designing smart optical damage sensors for defense applications.

ANALYSIS OF POINTS SCORED IN N.B.A. BASKETBALL.

A. Tan, Department of Physics, Alabama A & M University, Normal, AL 35762.

The distribution of points scored in the NBA finals is studied with the victorious Chicago Bulls of the 1990's as an example. The distribution of points scored by their number 1 scorer Michael Jordan showed a basis Gaussian pattern which is significantly skewed to the right (coefficient of skewness .60) and slightly leptokurtic or peaked (coefficient of kurtosis 3.21). The distribution of points scored by the number 2 scorer Scottie Pippen is significantly skewed to the left (coefficient of skewness -.41) and slightly platikurtic or flattened (coefficient of kurtosis 2.97). The distribution of combined points of the two scorers is significantly skewed to the left (coefficient of skewness -.43) and significantly platykurtic (coefficient of kurtosis 2.56). The plausible reasons for the nature of these distributions are discussed. The sum of the first two distributions is more Gaussian than the individual ones. Finally, the Jordan and Pippen scores showed light positive correlation (correlation coefficient .166).

THE DISTRIBUTION OF BATTING SCORES IN CRICKET. <u>A. Tan</u>, Department of Physics, Alabama A & M University, Normal, AL 35762.

The distribution of batting scores in Cricket shows an exponentially decreasing pattern similar to the radioactive decay curve. For an exponential distribution, the probability density curve is a function of a single parameter. The mean score of this distribution is always greater than the median score, the latter being $ln2$ times the former, and the mode of all scores is zero. The area under the batting curve yields the total runs scored by the batsman. The probabilities of scoring 0, 50, 100, 200 and 300 runs are calculated and compared with observation. Amongst all possible scores, the probability of scoring 0 is the highest. The partnership between two openers is calculated for the three cases of maximum positive correlation, no correlation and maximum negative correlation between the batting scores of the two openers and is found to be highly dependent upon the correlation coefficient of their scores. Comparison with actual partnerships indicates that the batting scores of the leading openers are positively correlated.

NON-DENSE EXTENSIONS OF KREIN'S FORMULA. <u>Sergev Belvi</u>, G. Menon, Dept. of Mathematics & Physics, Troy State University, Troy, AL 36082.

Krein's formula describes the resolvent difference of two self-adjoint extensions A_1 and A_2 of a densely defined closed symmetric linear operator A with deficiency indices (n,n), $n \in \mathbb{N} \cup \{\infty\}$. This formula was first derived independently by M. Krein and M. Naimark in the special case $(1,1)$. We provide some additional results related to Krein's resolvent formula for the case where operator A is a symmetric operator whose domain is not dense in the Hilbert space $\mathcal{H}$. We show that coefficients in Krein's formula can be expressed in terms of analogues of classical von Neumann formulas. The relationship between two Weyl-Tichmarsh m-functions corresponding to the self-adjoint extensions A_1 and A_2 of a non-densely defined symmetric operator is established as well.

THE EFFECTIVENESS OF SEDIMENTATION FENCES IN THE VALLEY AND RIDGE PHYSIOGRAPHIC REGION.

Janna Owens, Dept. of Biology, Univ. of AL at Birmingham, Birmingham, AL 35294. Laura Lokev, Dept. of Civil and Environmental Engineering, Univ. of AL at Birmingham, Birmingham, AL 35294.

Sedimentation is one of the largest pollution problems in the valley and ridge region of the Cahaba River. Control of sediment is important if this valuable resource is to be protected. The most commonly used form of control is a sedimentation fence. Sedimentation fences are designed to slow the velocity of the stormwater runoff, and allow the particles to settle out. This prevents contamination from entering nearby streams. However, small diameter soil particles and high intensity rainfall make this type of control less effective throughout much of the southeast. The purpose of this study was to evaluate the performance of sediment fences under these conditions. Samples were taken at small construction sites upgradient and downgradient from the fence. The samples were tested for total solids and turbidity using standard methods and a coulter counter and the results were analyzed. For fences that were installed correctly, these results indicated a 40% decrease in the amount of sediment that entered the streams. Alternate methods, including grass swales and vegetative buffer zones, need to be investigated for increased removal of small clay particles.

INDUSTRY AND ECONOMICS

THE JOYS OF LINUX.

William A. Hailey, Department of Computer Information Systems, Univ. North Ala, Florence Alabama 35632.

Linux is one of the brightest stars to enter the computer galaxy in some time. The operating system, created in 1991 by a University of Helsinki Computer Science graduate student, provides a low-cost option to Windows based systems and standard UNIX. Large corporations, like IBM, Oracle, Sun Microsystems, are supporting the introduction of Linux to the business environment. This research provides a case study, documenting one school's approach to providing instruction in the Linux/UNIX operating systems. It investigates the reasons for, problems with, and means of creating a Linux-based computer instruction.

Abstracts

ENVIRONMENTAL DEGRADATION AND ECONOMIC CONDITIONS OF ETHIOPIA.

Fesseha Gebremikael and Eric Rahimian, Dept. of Economics, Finance, and Office Systems Management, Alabama A&M University, Normal, Alabama 35762.

During the last three decades the number and length of droughts in Sub-Saharan Africa have increased. Droughts have caused the enlargement of deserts and conversion of the arid and semiarid lands (ASAL) into deserts. Since the Sudano-Sahelian region in general, and Ethiopia in particular, has recently experienced more severe droughts, this research focuses on Ethiopia. Population growth and droughts in Ethiopia have led subsistence farmers to move out of marginal and depleted lands to extend cultivation into forested areas, fragile river basins, and mountain zones. Cultivation on vulnerable lands has caused loss of biodiversity and accelerated soil erosion, making droughts more likely and the threat of hunger more chronic. Overcultivation, overgrazing, deforestation, overexploitation of water, and poor irrigation are the main reasons for reoccurrence and prolonging the droughts. The most disturbing outcome of soil erosion and degradation of productive lands is food insecurity. Desertification has created an influx of environmental refugees to urban areas. These are mostly the people who are forced to abandon their unproductive lands and migrate to other regions and urban slums. The impoverishment of people, the huge number of environmental refugees, and the widespread socio-political upheavals are manifestations of a perhaps more dreadful famine in the near future if the current efforts do not lead to sound solutions for environmental degradation problems. After exploring the trends in the socioeconomic data, population growth, and environmental damage, this study has tried to identify the reversible causes of droughts and has recommended strategies for combating desertification as well as improving the economic growth in Ethiopia.

THE UNDERCLASS AND WELFARE. Daniel C. Morgan, Jr., University of Texas at Austin (emeritus), James G. Alexander. Alabama A&M University, and Paulette Alexander, University of North Alabama.

Anti-science is at a peak in America and it is the duty of members of science academies to stand in protest. The historically blatant example is the "evolution issue," though from a scientific standpoint there is not one (at least not of the sort that several state governments, including Alabama's, are becoming involved). Another highly visible example is the "controversy" over global warming, notwithstanding the scientific evidence that it is occurring and the scientific explanation of the observable reality. The point is that the anti-science viewpoint has developed a key defense against scientific progress: 1) scientific proof is by its nature tentative (i.e., failure to disprove) and 2) someone with a contrarian perspective can always be found. The global warming contrariness stands in current bold relief. The Wall Street Journal, no great friend to "environmental extremists," reports (3-22-2001) that the anti argument is now in its third stage: first deny the scientific evidence; second deny the scientific explanation, and third criticize the scientific models. So far, preface--but not merely so since if rules of honor are in play we all present ourselves here as scientists. The topic of this research is an old one, and in fact one upon which there is substantial scientific evidence. An ongoing and prominent argument for a full generation has centered upon the issue of causation between "welfare" and the underclass (under variegated definitions, but poverty will do). While there are multiple forms, the basic question is whether welfare is the response to or cause of poverty. The answer is the former, though certainly from an anecdotal (unscientific) standpoint there are exceptions. Why does this old issue matter now? It is a part of the anti-science movement discussed above. The immediate triggers of concern are the so-called "welfare reform" legislation of 1996 and the "charitable choice" initiative of 2001. There are clearly legal and constitutional issues, especially with the latter, and social scientists are remiss if they fail to point out policy deficiencies as well. But aside from a particular policy analysis, social scientists put their legitimacy in question if they fail to question the foundational premises and philosophical underpinnings to contemporary policies. Yes, there are undesirables feeding at the public trough and they include welfare recipients. But no, the evidence overwhelmingly indicates that the problem of the poor is lack of income and wealth, not moral deficiency. Thus, help--not forced pretend work or pretend religion -- is the sensible response. Science cannot always be right, but let's try to be sensible.

Abstracts

THE CORPORATION. James G. Alexander and Marvin Adcock, Alabama A&M University, and Paulette S. Alexander, University of North Alabama.

The corporation -- a self-bodied firm -- was the signature economic institution of 20th century America. Moreover, there are current signs of still ascending power. Nevertheless, it remains underscrutinized and as a matter of economic pedagogy almost invisible. Economic literature generally, at least implicitly, accepts the corporate form of business enterprise as exogenous and perhaps inevitable. Since some 90% of market-oriented output is produced by corporations, "the firm" of economic theory in actuality implies the corporation. Yet economic theory retreats to an earlier age for its conceptualization of the firm as a productive entity tended by its owner. Failure to reconcile this dualism has not served the discipline well. In a Flintstones' history sort of way, economists are inclined to take the corporation as a fixed form, inviolate and probably immutable. Such a view is misleading and at best ahistorical. During the age of Thomas Jefferson and Adam Smith--the democracy revolution in governance and economics--the corporate form existed but had not yet arrived as a broadly applicable economic institution. Indeed, its history had centered more on university, church, and city than on business enterprise. And even the initiation of the form into "business" focused on commercial instead of productive activities. Smith, was primarily interested in economic architecture, not value. Even so, be held limited regard for the corporate form as he did not---even as the Industrial Revolution began--see it as broadly serviceable. On this the record is clear: he was wrong. But on the relation between the private and public sectors, and the corporation's role in it, there is room for greater controversy. The democracy revolution was predicated of compatibility of private and public interests. Serendipitously, the route to doing well (making money) was doing good (helping others). This form of serendipity has long since been called into serious question by Thorstein Veblen and others. The capacity of the corporate form to concentrate both market and political power stand in counterpoint to the foundations of the democracy revolution. Moreover, it is evident that "corporate" interest and power is potentially misleading due to the diversity of internal needs: owners, management, workers. The transformation of the corporate construct from its socio-political origin to its economic manifestation was achieved with little input from economists. There is now another transformation underway, this time driven by transition to the "information economy" and other structural changes. Economists need to inform themselves, and inform the necessary reconceptualization.

THE BAHAMAS' ECONOMIC GROWTH AND TRADE.

Archibald L. Minnis and Eric Rahimian, Dept. of Economics, Finance, and Office Systems Management, Alabama A&M University, Normal AL 35762.

This paper has studied the factors that influence the growth and trade position of the Bahamas. These factors include the imports and exports as well as the potential opportunities that exist for economic development. It is illustrated how the Bahamas government generates its revenues from such sources as customs duties property taxes, stamp taxes, excise taxes, and tourism. The government should diversify the economy, expand the various agricultural and industrial productions, and enhance the economic growth through better education and training. There are numerous opportunities for foreign investment in the Bahamas. Potential investors can benefit from supportive policies for foreign investment and the Bahamas' tax haven status. The revenue of the tourism industry and the number of tourists have been stable over the last decade but it is expected to grow in the near future due in part to the governments' efforts to reduce stamp taxes levied on various tourism related expenses. The recent completion of the Sun Casino and International's Atlantis Resort, the Breezes Super Club and the Sandals Resort are major reasons to expect further growth. The export trade has shown a dramatic decrease at the end of 1989. This was the year that BORCO (BAHAMAS OIL REFINING COMPANY) ceased its refining operation and stopped exporting refined oil. This paper inquires whether the government of the Bahamas should provide some incentive to this company or others to revive the refining operations to enhance the economic growth. There is also a good potential for growth of the export of goods from the Bahamas.

SCIENCE EDUCATION

IS A HOLE THROUGH THE CENTER OF THE EARTH A BOTTOMLESS PIT?

Gene Omasta, Professor Emeritus, Troy State University, Troy, AL 36082.

The motion of an object dropped through a hole passing through the center of the earth is modeled with the aid of a TI-83+ graphing calculator. The equations of motion of the object are developed using two models; 1) assuming a uniform earth density, 2) assuming an exponentially increasing earth density as you proceed from the surface towards the center of the earth. For each of these models, the velocities of the dropped object are compared as a function of position and the periods are determined.

THE SUN EMULATOR: A NEW TYPE OF HELIODON.

Norbert M. Lechner, Building Science Dept., Auburn University, AL 36849

Energy consumption is the primary cause of global warming. Buildings use over a third of all the energy consumed in the United States, which is primarily used for heating, cooling and lighting. Solar responsive buildings can significantly reduce this energy demand. They can harvest the winter sun for heating, they can reject the summer sun to reduce the cooling load, and they can collect a small amount of quality daylight year-round to replace most of the electric lighting during daylight hours. How do we teach developers, builders, and architects the basic concepts that will allow them to design solar responsive buildings rather than buildings with energy-guzzling mechanical equipment and electric lighting, and how do we convince owners to request such buildings? Heliodons are powerful tools for demonstrating the potential and logic of solar design to people of any age or education level.

The author has developed a new kind of heliodon, called the Sun Emulator, which is especially useful for both the initial teaching of solar geometry and for the actual design of buildings and communities that are in harmony with the sun. It is an exceptionally powerful teaching tool because of its conceptual clarity in the use of physical models that makes the experience both interesting and understandable for everyone. The Sun Emulator can be used by architecture schools, building schools, K-12 schools, science museums (especially the hands-on type), energy resource centers, and practicing professionals (architects, builders, and developers).

TECHNOLOGY IN MOTION: BRINGING TECHNOLOGY TO ALABAMA K-12 TEACHERS. <u>Richard Hawk</u>. Southeast Alabama Regional Inservice Center, Troy State University.

Since 1997 **Educational Week** has published the results of its surveys of the teachers in the United States to determine their use of computers in the classroom. From this data, it was estimated that in Alabama, 18,000 teachers were not using computers in teaching. Governor Don Siegelman decided to do something about this situation and in January, 2000, Technology in Motion was born as a governor's initiative. One trainer was hired in each of the eleven Teacher Inservice Centers and they received the equipment and mandate to provide computer literacy training to teachers in K-12. The equipment consists of Apple iBook laptop computers with wireless networking capability, additional memory, and the base stations required for the Airport© wireless network. Software includes Virtual PC©, MicroSoft Windows 98© and Microsoft Office 2000©. Teachers attend a two and one-half day workshop in their schools. Topics include: computer familiarization, Windows©, Microsoft Word©, the Internet, email, and MicroSoft PowerPoint©. In addition, each teacher who wishes to have one, can 'borrow' a laptop computer to use at home for the ensuing seven days. Additional workshops have been added to the basic curriculum in computer literacy: Marcopolo and the Alabama Virtual Library while some trainers have developed specialized workshops when requested by schools.
This program elaborates on the equipment provided, the curriculum and its additions, examines teacher reaction and reports on the impact of Technology in Motion and its ancillary programs on teacher training in technology.

A COLLABORATIVE RECOMBINANT DNA TECHNOLOGY COURSE WITH LABORATORY. <u>Leo Pezzementi</u> and Larry Fish. Division of Science and Mathematics, Birmingham-Southern College, Birmingham, Alabama, 35254

Both the classroom and laboratory portions of this course in recombinant DNA technology are designed to promote contextual, collaborative, inquiry-based learning of science. Students teach one another and have a sense of ownership of their education. In class, emphasis is on group presentations and critical reading and discussion of scientific articles that use recombinant DNA technology to address questions in both basic and applied research. In the laboratory, investigative projects are designed to help students pose and answer two questions: 1) How do you clone a gene? and 2) And so then what do you do with it? The two projects are random cDNA cloning, and *in vitro* expression and site-directed mutagenesis of cholinesterase; the latter project integrates the research and teaching of the principal investigator. Students present the results of their two laboratory projects in a poster and in a paper with the format of a scientific article. Funded by NSF-CCLI Award Number 9950225.

STUDENT SCIENCE ENSEMBLE: BRIDGING GAPS USING CREATIVITY. Tyler N. Burgess and Perry A. Tompkins, Samford University, 800 Lakeshore Dr. Birmingham, AL 35229.

As students transition middle school and enter high school, the active interest in science of all students decreases, yet the decrease in women and minorities is disproportionate. The purpose of this project is to bridge the gap between the elementary age science enthusiasts and the not so interested high school crowd. The focus is on retaining all students' interest in science, not to just encourage careers in science. This informal science education project is called "Student Science Ensemble". Middle-school students will be self-selected to "try out" for participation in an after school activity that will follow the "show choir" model. They will select, create and develop a student-led science performance for their peers and younger age students. These performances, from different schools, could eventually be formed into regional competitions. This model shows promise of success even in a zero funding environment. We believe that the "show" format will be more attractive to females and minorities than normal science class, as it focuses on the creative and fun nature of science.

BEHAVIORAL AND SOCIAL SCIENCES

EXPLAINING MASS MURDER AT ROUTINE ACTIVITIES. Thomas A. Petee, Janice Clifford Wittekind and Greg S. Weaver, Dept. of Sociology, Anthropology and Social Work, Auburn University, Auburn, AL 36849.

Over the past several years, mass murder incidents have increasingly peaked the interest of criminologists. Much of the focus centered contextual factors, the different types of mass murder and the outcome of these events. Given these emphases, a gap in the research exists in explaining theoretically the distribution of mass murder incidents. The current study examines mass murder using the routine activities approach. The routine activities model by Cohen and Felson (1979) was developed as an explanation for patterns in criminal behavior. It suggests that predatory crimes follow a predictable pattern when three elements converge: suitable targets, motivated offenders and lack of guardianship. Mass murder incidents occurring in the United States between 1980 and 2000 will be used to test the routine activities as an explanation for this phenomenon.

FEDERAL REDISTRIBUTION EFFECTS ON STATE POLITICAL ECONOMIES.

Arthur S. Wilke and Gregory S. Kowalski, Department of Sociology, Anthropology and Social Work, Auburn University, Auburn, 36849

The Federal Budget and the States is a project spearheaded by former Senator Daniel Patrick Moynihan. The most recent edition (2000), the 24th in the series, details balances of payments from the federal government to the states. States in the West South Central region - Alabama, Kentucky, Mississippi and Tennessee - are among the top 20 states receiving more funds from the federal government than are sent to it. In a press conference introducing this report, Senator Moynihan and a representative from Harvard University's Taubman Center for State and Local Government, a pattern having political implications was suggested: Northeastern, upper Midwestern and Pacific coast states, states that voted in the 2000 election for Democratic candidate Albert Gore, are areas in which there is a negative balance of payments: more goes to the federal government than is returned. By contrast, in most states in which a majority voted for now President Bush, those states enjoyed a positive balance of payments: more was received from the federal government than was sent. This paper examines the impact of these transfers on the per capita state economies and finds while these aggregate transfers on a per capita basis are suggestive, the summary data in the above report are likely to have more political ideological value than analytic significance.

CIVIL ASSET FORFEITURE REFORM ACT OF 2000 (CAFRA) HIGHLIGHTS.

Gloria McPherson, Dept. of Justice & Public Safety, Auburn University Montgomery, Montgomery, AL 36117.

Civil forfeiture is an ancient legal procedure which has proven to be effective in attacking modern crime. Although it is self-evident that criminals should not be allowed to benefit from their illegal acts, during the past decade the civil forfeiture legal process had come under the close scrutiny of Congress and the Judiciary. As a result, Congress passed the Civil Asset Forfeiture Reform Act of 2000, which became effective on August 23, 2000. This Act is the most significant piece of asset forfeiture legislation to be enacted since the Comprehensive Crime Control Act of 1984. The major areas of reform and improvements include changes in filing and notice deadlines; a claimant's hardship provision; changes in trial procedures (excludes admissibility of hearsay in government's case); a uniform innocent owner defense; pretrial appointment of counsel in cases involving residences; seizure warrant amendments; codifies the "post and walk" rule; law enforcement improvements (*e.g.* obstruction of justice statute to apply to destruction of property subject to forfeiture); reforms in international cases; and amendments that affect the "money laundering statute."

RACE AND POLICE IN SELMA, ALABAMA. Gerald P.Fisher. Criminal Justice Department, Columbus State University, Columbus, Georgia, 31907.

What is the current opinion of the African-American citizens in Selma, Alabama towards the police? The turbulent 1960s and the "Bloody Sunday" crossing of the Edmund Pettus Bridge elicits mental images of peaceful protestors being beaten and tear gassed by law enforcement officers. In the almost forty years since the birth of Civil Rights, have conditions and opinions changed? What is the current relationship between minority citizens and the police? Is it different from conditions that exist elsewhere in the country? The world?

THE DIFFUSION-ADOPTION MODEL: SOUTHEASTERN BEEF AND PEANUT FARMERS USE OF PERSONAL COMPUTER AND INTERNET WHEN MAKING FARM BUSINESS DECISIONS. Laura Hall, John Dunkelberger, and Wilder Ferreira, Department of Rural Sociology, Auburn University, Auburn, Alabama, 36849-5406

Rapid spread of the PC for business purposes and accessing information on the Internet raises questions about the behaviors of farm operators for adopting and incorporating the technology into their agricultural decision-making. In 1998, a survey was conducted to determine the use of PC's and the Internet for business purposes. In order to obtain farmers' Internet attitudes and behaviors, pertaining to the use of technology, 647 questionnaires were mailed to leading farmers in Alabama, Southeast Georgia, and Northwest Florida. The questionnaire was completed and returned by 241 farmers. This analysis focuses on the stages of adoption of these agricultural producers and how they are currently using this technology and resources in the farming business. The diffusion-adoption framework is employed to characterize farmers in the adoption process, and to determine operator and farm characteristics by stage. Findings indicate that 26% of the farmers are considered "laggards" by having no PC, 22% are "late majority" by utilizing the PC, 11% are the "early majority" by having access to the Internet, and 29% use the Internet for farm business making them the "early adopters". The final 13% of the farmers are considered "innovators" by accessing the Internet for farm business in marketing.

INFLUENCE OF MARITAL STATUS AND OTHER DEMOGRAPHIC FACTORS ON LIFE SATISFACTION AND INSTITUTIONAL CONFIDENCE.

Janice Clifford Wittekind and Arthur S. Wilke, Department of Sociology, Anthropology and Social Work, Auburn University, Auburn, AL 36849.

Using the 1994 General Social survey, this paper examines the degree to which marital status of females and males is reflected in measures (6 items) of life satisfaction and general well-being and confidence in dominant institutions (13 items) in two age cohorts: 20-39 and 40-59 year olds. With life satisfaction items, little gender difference is noted. As has been previously reported, married persons tend to report greater happiness and better health. And with the exception of the divorced, the older cohort view others as more helpful and less predatory. With respect to confidence in institutions, age is generally not distinguishing. However married males, compared with married females, express less confidence in banks and financial institutions and in organized labor. The same pattern with respect to organized labor obtains for 40-59 year olds. It also obtains for 40-59 year old divorced males. Never married 20-39 year old females polarize on confidence in the federal government expressing both less confidence and more confidence than their male counterparts who have a more modest view toward this institution. Males 20-39 express far less confidence in the press than females, while males 40-59 have greater confidence in medicine than their female counterparts. A major difference among 40-59 year olds appears in confidence in the military: 46.1% males express a great deal of confidence whereas only 26.0% of females in this cohort express similar confidence. Other contingent factors are detailed.

FARM PROPERTY CRIME EXPERIENCE, PERCEIVED SERIOUSNESS AND ADOPTION OF RISK OF VICTIMIZATION STRATEGIES: AN ALABAMA STUDY.

Quita J. Rosser and John E. Dunkelberger, Department of Rural Sociology, Auburn University, Auburn, AL 36849-5406.

In this paper our purpose is to measure the extent to which Alabama farm operators express fear of farm property victimization. Fearfulness is analyzed in terms of how it is impacted by crime victim experience and in turn, impacts the adoption of property security behaviors. Mail survey responses obtained from 428 farm operators provide the data. Indexes measuring the perceived seriousness of farm property crime and fearfulness of being a farm crime victim are developed. Two measures of property security behaviors available to farm operators for reducing the risk of farm property victimization are identified: installing security devices and adopting security behaviors. A theoretical framework is employed using the interaction between victimization experience with farm property crime, perceived seriousness of farm crime in the local area, and adoption of risk reduction technologies and behaviors.

ENTREPRENEURIAL LEADER IN CHINA. Jifu Wang and William R. Boulton, Management Department, Auburn University, AL 36849

When Min Zhang, current CEO and Chairman of Board of Directors of Chongqing CHN & CHN Ceramics Co., Ltd. (CHN), was nominated as the factory manager at the end of 1993. CHN was deep in debt, and on the edge of bankruptcy. Under China's central planning economic system, Zhang restructured his state-owned enterprise into a joint venture, which enabled him to purchase the most advanced ceramics manufacturing equipment in the world. In 1995, Zhang implemented a Computer Integrated Manufacturing System (CIMS) to integrate information technology and modern management methods with manufacturing technology. CIMS changed all of CHN's processes, including design, computer-aided process planning, product data management, simulation databases, inventor-user interactions, rapid 3-D "virtual" prototyping, and computer-aided manufacturing. CIMS process and resource optimization improved CHN's TQCS (time to market, quality, cost and service). CIMS was applied to product development to integrate shapes, patterns, technology, and tools to reduce development time. The integration of the information for ceramics manufacturing improved the management and production efficiency. Zhang's innovations in CHN helped him attract and keep the industry's best people with compensation packages and opportunities to self-actualize. Zhang's marketing strategy was "walk with two legs". On the one hand, he tried his best to conquer the domestic market with his premium products. On the other, he went all out to set up worldwide distribution channels. By integrating the best western hardware and software with the best eastern intelligence and experience resulted in CHN becoming a global leader in the ceramics industry with a superior brand and premium quality reputation.

THE IMPACT OF THE PRISON LITIGATION REFORM ACT AND THE ANTITERRORISM AND EFFECTIVE DEATH PENALTY ACT ON PRISON LITIGATION.
Betsy A. Witt, Criminal Justice Dept., Columbus State University, Columbus, GA 31907.

In 1996, Congress passed two acts which were intended, in part, to curtail the number of appeal cases filed by persons incarcerated in state and federal prisons. This paper briefly summarizes these acts while exploring their effect on prison litigation. A preliminary evaluation of whether they have fulfilled their original intentions is presented. Included is an analysis of three U.S. Supreme Court cases which challenged particular sections of these acts and the resulting decisions of the Court.

HEALTH SCIENCES

KNOWLEDGE AND ATTITUDES ABOUT THE ELDERLY. Robert E. Pieroni, MD. Julia Hartman, John Higginbothom, PhD. University of Alabama School of Medicine, Tuscaloosa, AL 35486.

Despite the rapid aging of our society, numerous studies indicate that the average American has limited knowledge of many facets of gerontology. I have been conducting studies with a wide array of audiences, both professional and lay, using Palmore's revised and updated Facts on Aging Quiz. Of the 208 volunteers who took the brief 25-item questionnaire, the mean and median score was just 60% with a mode of 64%. Scores ranged for 36% to 80%. Marked deficiencies in biomedical, psychosocial and socio-economic knowledge were evident even among the highly educated and, indeed, among the elderly themselves. The frequent misconceptions and negative biases concerning our elderly underscore the need for timely and concerted efforts to better educate the public and especially health care providers, about the multifaceted consequences of aging and to diminish negative stereotypes and aageism which are all too prevalent in our society.

GULF WAR SYNDROME (GWS): A REAL ENTITY? Robert E. Pieroni, M.D., , University of Alabama School of Medicine, Tuscaloosa, AL 35486.

On the tenth anniversary of the Gulf War considerable controversy remains regarding the numerous symptoms reported by veterans and if an actual syndrome exists. A variety of apparently unrelated manifestations such as fatigue, fever, headaches, muscle and joint pains, sleep and digestive disturbances, memory loss and numerous affective complaints have been described. Of the nearly 700,000 American troops deployed to the Gulf theater, many have filed disability çlaims for illnesses that defy easy explanation. All military conflicts have involved severe stress and although different labels have been attached in the past to reactions to war (e.g., neurasthenia, shell shock, effort syndrome, etc., many veterans consider stress and "chronic fatigue syndrome" as inadequate to explain their symptoms. A variety of etiological agents have been proposed including chemical warfare agents, depleted uranium or other toxic exposures. I shall review arguments both for and against the existence of a distinct GWS using personal experience, research results and recent literature reviews.

Abstracts

Cochlear implants and their effects on the family. <u>Christina M. Allegretti</u>, University of Alabama School of Nursing, University of Alabama at Birmingham, Birmingham, AL 35216.

A relatively new procedure, cochlear implantation, has taken off in the past several years. The implant converts sound into electrical signals, which then stimulates the nerve ending, in order for the recipient to hear. The purpose of this study was to evaluate the effects on the family, both positive and negative, of cochlear implants in their hearing impaired child. The data collection for this case study (including mother, father and one child) included systematic organization as a unit. The data analysis then focused on the data as a whole. Research questions answered include concepts of familial adaptation, concerns throughout the implantation process, desired outcomes, and specific benefits received by the family. Three interviews and one checklist evaluated family members before, during and after implantation. The development of the behavioral checklist for the recipient assessed the changes before the implant and after programming of the device. Each interview, lasting thirty minutes, took place on an individual basis. The interviews and checklists were conducted either via phone or at a clinic near an urban university. The findings reflect several common themes: ambivalence, excitement, fear, anxiety, impatience, and nervousness. Nursing implications include basing practice on educating the family. Support for this study granted by Nu Chapter, Sigma Theta Tau.

NOVEL CLINICAL EXPERIENCES FOR NURSING HONORS STUDENTS. Ellen B. Buckner, University of Alabama School of Nursing, University of Alabama at Birmingham, Birmingham, AL, 35294-1210

In 1999 the University of Alabama School of Nursing faculty voted to implement a disciplinary honors program. It was hoped that the benefits of this program would include development of critical thinking skills and integration of nursing knowledge across multiple settings. The first class was admitted in winter 2000. Mentorships were initiated with clinical nurse specialists, a diabetes educator and other interdisciplinary clinicians. First year student experiences included work as a staff member/counselor for children attending a diabetes camp, extensive neuro-assessment in a neurological intensive care unit, following a family whose child was receiving a cochlear implant for hearing impairment and participation in a camp for "cancer kids." Student projects consisted of clinical research or application of research in the clinical area. Students designed projects included a family case study analysis, description of developmental and psychosocial changes from before to after camp, and description of stroke patients' recollection and attribution of their stroke symptoms. In this first class offering students have integrated topics in statistics, design, and nursing knowledge. They demonstrated questioning, independence, creativity, and reality testing as they sought to take standard practices to renewed relevance.

S-ALLYLMERCAPTOCYSTEINE: EFFECT ON CASPASE-3 ACTIVITY.

Betina McNeil, Robert Jackson, and Ephraim T. Gwebu, Department of Research, Oakwood College, 7000 Adventist Blvd. NW Huntsville, Alabama 35896.

The process of programmed cell death is called apoptosis. The effect of excessive apoptosis within the cells, result in Alzheimer's Disease (AD). During Alzheimer's, apoptosis occurs in neuronal cells causing neurodegeneration. The caspase family is associated with this apoptotic reaction in AD. The primary caspase, only found active when cells are undergoing apoptosis, is caspase-3. Inhibiting this enzyme may aid in the inhibition of neuronal apoptosis, related to AD. S-allylmercaptocysteine (SAMC) is a constituent of the Aged Garlic Extract (A.G.E.). We propose that this thioallyl compound will inhibit the activity of caspase-3. The purpose of this study was to determine the effect of SAMC on caspase-3 activity. Calbiochem's Caspase-3 assay kit and protocol were utilized to measure the protease activity according to the manufacture's guidelines. Absorbance was read under 405nm on a BIO-RAD's microplate reader. Results and discussions will be presented.

CHILDREN'S DIABETES CAMP EXPERIENCES: CHILD'S AND PARENT'S PERCEPTION.

Ifeoma Opara, University of Alabama School of Nursing at Birmingham, AL, 35294. Karen McNider, BSN, CDE, The Children's Hospital of Alabama, Birmingham, AL 35233.

Many children with diabetes have difficulties in adapting to changes associated with treatment. Parents, too, may be unprepared for the demands. Diabetes camp is a summer camp established for diabetic children to provide recreational, social, and educational opportunities in a safe, monitored environment. Diabetes camps afford the parents with a relief and some degree of confidence to trust their child to perform self-care. For the children, it provides a way to feel some control of the disease and experience the accomplishment of self-care. The purpose of this study is to describe the children and the parent's perception of changes after camp in areas of education, psychosocial, and development. Diabetic children who did and who did not attend camp and one parent for each child were interviewed. The interviews took place at the Endocrinology Clinic, The Children's Hospital of Alabama. Glucose control was recorded using spring and fall (pre and post) Hemoglobin A1C levels. An investigator-designed questionnaire was used. Children who participated in diabetes camp improved in diabetes self-care skills and acquired new knowledge. For these children, social motivation and peer interaction were major factors promoting assumption of self-care responsibilities; they learned how to take control of diabetes disease. In addition, it was found that camp participation fosters Erikson's psychosocial development of industry over inferiority through skill mastery and self-accomplishment through independent diabetes self-care. Parents identified that with diabetes camp participation, they have confident to transfer diabetes self-care management to their children and that early transfer of self-care to child increases child's competence. Nursing implications are to encourage parents to seek ways to normalize life for the child with diabetes through camp participation and to supervise and support the child physically and emotionally when needed at home. This study was supported in part by a grant from Nu Chapter, Sigma Theta Tau.

L-CYSTEINE: EFFECT ON CASPASE-3 ACTIVITY.

David Ruff, Robert Jackson, Ephraim Gwebu, Department of Research, Oakwood College, 7000 Adventist Blvd, NW, Huntsville, Alabama 35896

Caspase-3 is an enzyme that is an important element in apoptosis or programmed cell death, a normal process in biological systems. However, under neuropathological conditions, such as Alzheimer's disease, the activity of this enzyme may be abnormally high, resulting in loss of valuable neurons. Inhibition of this enzyme may be a reasonable therapeutic approach to Alzheimer's disease. The active sites of caspase -3 may contain sulfhydryl groups. We postulate that thiol-containing compounds such as L-cysteine may inhibit the activity of the caspase-3 enzyme by binding to the active site. Wakunaga of America (Mission Viejo, CA) kindly donated SAC in powder form. Varying concentrations of SAC in buffer were used. A colorimetric assay kit from Calbiochem (www.calbiochem.com) measuring the caspase-3 was used according to protocol. After incubation of the enzyme, absorbance was read in a micro-plate reader at 405 nm from BioRAD. Results will be discussed.

PATIENTS' RECOGNITION OF SIGNS AND SYMPTOMS ASSOCIATED WITH STROKE,

(Dena M. Guy), Joan S. Grant, University of Alabama School of Nursing, University of Alabama at Birmingham, Birmingham, AL, 35294-1210

The purpose of this study was to determine signs and symptoms associated with a stroke that were recognized by stroke survivors and to determine if they attributed the signs and symptoms they experienced to a stroke. The sample consisted of 10 individuals admitted to a large state university hospital for stroke due to brain infarction or ischemia secondary to a thrombus or emboli. The research project utilized a descriptive design and both quantitative and qualitative methods were used to obtain data. The participants consisted of 6 males and 4 females (7 Caucasians and 3 African Americans) who ranged in age from 45 to 75 years ($\bar{x}$=57.9 years). Without prompting, dizziness (40%) was reported by stroke survivors as the most common symptom associated with a stroke. With prompting, hemiparesis (50%) was reported as the most common symptom. In the study, 80% of the participants did not attribute their signs and symptoms to a stroke. Of the two participants who correctly attributed their signs and symptoms to a stroke, one had previously experienced a stroke. None of the stroke survivors sought immediate medical attention. In conclusion, participants in the study failed to adequately recognize signs and symptoms associated with a stroke and did not attribute signs and symptoms they experienced to a stroke. Healthcare professionals should educate individuals to recognize signs and symptoms associated with a stroke and to seek immediate treatment. This study is supported partially by Nu Chapter, Sigma Theta Tau International, nursing's honor society.

ZIMBABWE'S NDEBELE PLANT EXTRACT: EFFECT ON CASPASE-3 ACTIVITY

Genevieve Holl, Robert Jackson and Ephraim T. Gwebu. Department of Research, Oakwood College, Huntsville, Alabama 35896.

The indigenous peoples of Africa have a rich heritage of traditional medicine based upon the native plants. Trial and error techniques have been used over hundreds of generations, thus discovering innumerable forms of plant-based treatment for various ailments and afflictions. It is very evident that Zimbabwean traditional medical practitioners routinely treat infections, types of cancer, and allergies, with remarkable success. It is possible that Zimbabwe has plants containing ingredients for the treatment of numerous illnesses responsible for millions of cases of morbidity and mortality in the USA today. Excessive apoptosis occurs in Alzheimer's disease. Caspase-3, a critical effector of neuronal apoptosis, may be inappropriately activated in Alzheimer's disease. The purpose of this study was to determine if an indigenous Ndebele plant extract, Isithundu, inhibits Caspase-3 activity in a dose-dependent manner, in vitro. A physiological buffer was used to make serial dilutions of the Ndebele plant extract. The Calbiochem (www.calbiochem.com) protocol was used to assay the Caspase-3 activity. The duration of incubation of the enzyme and dilutions was four hours, at a temperature of 37?C. Absorbance was read at 450nm, using a microplate reader (BioRAD). The results on the effect of this plant on Caspase-3 activity, in vitro, will be discussed.

PREVENTION OF AVOIDABLE ADVERSE DRUG REACTIONS

(ADR's). Robert E. Pieroni, M.D., University of Alabama School of Medicine, Tuscaloosa, AL 35486.

A recent Institute of Medicine report concluded that 44,000 to 98,000 Americans die yearly from medical errors in hospitals. These figures would obviously be even more alarming if they included substandard care provided in ambulatory and long term facilities. Medication errors, including inattention to potential drug interactions (despite the ready availability of print and computerized "early warning systems") are estimated to kill over 7,000 Americans each year. I shall present several clinical vignettes where "polypharmacy" and ignorance of potential ADR's resulted in severe consequences. Several mechanisms of ADR's will be described, as will the importance of the cytochrome P450 enzymes and the potential for foods (e.g., alternative medical products, and even marmalade), and beverages (e.g., grapefruit juice and alcohol), in profoundly affecting drug levels and resulting in ADR's, including death. Recommendations for avoiding clinically significant ADR's will be presented in detail.

AGED GARLIC EXTRACT: EFFECT ON CASPASE-3 ACTIVITY, IN VITRO.

Robert Jackson, and Ephraim T. Gwebu, Department of Research, Oakwood College, 7000 Adventist Blvd, Huntsville, Alabama 35896.

Apoptosis is an essential and well-controlled form of cell death occurring under a variety of physiological conditions. However, under pathological conditions, such as Alzheimer's disease (AD), apoptosis results in uncontrolled death of valuable neurons. A key mechanism in apoptosis is the activation of caspase-3. Caspase-3 (Cpase) is found only in cells undergoing apoptosis. Cpase activity is not detectable prior to apoptosis. It first becomes detectable early in apoptosis, continues to increase as cells undergo apoptosis, and rapidly declines during the late stages of apoptosis. Its activity is an early marker of cells undergoing apoptosis. Inhibition of Cpase may reduce of uncontrolled apoptosis prevalent is such a disease as AD. Indeed, excessive apoptosis occurs in AD. Cpase, a critical effector of neuronal apoptosis, may be inappropriately activated in AD. Studies from our lab have shown that aged garlic extract protects neuronal cell death induced by Alzheimer's β-amyloid peptide. The purpose of the study was to whether aged garlic extract inhibits the Cpase activity in vitro. Cpase was obtained from Calbiochem™ as a kit. Enzyme activity was assayed according prescribed protocol and incubated for 4 hours at 37°C. Varying concentrations of aged garlic extract were used. We report that aged garlic extract inhibits Cpase in dose dependent manner. Aged garlic extract may be effective in reducing apoptotic death of neurons. Supported in part by NIH/AREA Grant # 1 R15 GM5764 and Carmen/Carlton Sampson Fund.

GARLIC S-ALLYLCYSTEINE: EFFECT ON THE APOPTOTIC CASPASE-3, IN VITRO.

Catherine Taylor, Robert Jackson, and Ephraim T. Gwebu, Department of Research, Oakwood College, 7000 Adventist Blvd. NW, Huntsville Alabama 35896.

Programmed cell death (apoptosis) is an essential and well-controlled form of cell death occurring under a variety of physiological conditions. However, under pathological conditions, such as Alzheimer's disease (AD), apoptosis results in uncontrolled death of valuable neurons. A mechanism, which is consistently implicated in apoptosis, is the activation of a caspase family of cysteine proteases. Caspase-3 is one of the principal caspases found in apoptotic cells. It is a critical effector of neuronal apoptosis and may be inappropriately activated in AD. Inhibition of this enzyme may be critical in AD therapy. The thiol-oxidizing agents such as diamide induce apoptosis and activate caspase-3. AD brains have significantly increased activity of caspase-3, compared to controls and caspase-3 activity increases with age. We postulate that the thiol-antioxidant component S-allylcysteine (SAC) of dietary AGE may inhibit caspase-3 activity. The purpose of this study was to determine the effect of SAC on caspase-3 activity, in vitro. Wakunaga of America (Mission Viejo, CA) kindly donated SAC in powder form. Serial dilutions in buffer were made of the SAC. A colorimetric assay kit from Calbiochem (www.calbiochem.com) measuring the caspase-3 was used according to protocol. After incubation of the enzyme, absorbance was read in a micro-plate reader at 405 nm from BioRAD. There is evidence that SAC may inhibit caspase-3.
Supported in part by NIH/FRESP Grant # 1G11HD37200.

CASPASE-3 ACTIVITY AND THE EFFECT OF A TRADITIONAL MEDICINAL PLANT PRODUCT FROM ZIMBABWE. Samson Sibanda, National University of Science and Technology, Zimbabwe. Leah Miller, Robert Jackson, and Ephraim Gwebu, Oakwood College, 7000 Adventist Blvd., NW, Huntsville Alabama 35896.

Apoptosis is an essential and well-controlled form of cell death occurring under a variety of physiological conditions. However, under pathological conditions, such as Alzheimer's disease (AD), apoptosis results in uncontrolled death of valuable neurons. A mechanism, which is consistently implicated in apoptosis, is the activation of a series of cytosolic proteases, the caspases. One of these is caspase-3 found only in cells undergoing apoptosis and is one of the principal caspases found in apoptotic cells. Inhibition of caspase-3 is a potential therapeutic approach. There is ample evidence that Zimbabwean traditional medical practitioners routinely treat certain types of cancer, allergies and infection with remarkable success using medicinal plant products. Could such plants hold the secrets of AD treatment? The purpose of this study was to determine whether a plant extract from Zimbabwe's traditional herbal medicine inhibits caspase-3, *in vitro*. Serial dilutions of Zimbabwean plant extract were made in a physiological buffer. Caspase-3 activity was assayed using the manufacturer's protocol (Calbiochem, www.calbiochem.com). The enzyme was incubated with the extracts for four hours at $37^{\circ}C$ temperature. Absorbance was read at 405 nm in a micro-plate reader (BioRAD). The results on the affect of this plant will be discussed.

ENGINEERING AND COMPUTER SCIENCE

MORPHING TO OSCULATION. Xiaqing Wu, John Johnstone , Department of Computer and Information Sciences. The University of Alabama at Birmingham, Birmingham, Alabama, U.S.A. 35294-1170.

Morphing is a core operation in computer graphics. It has important applications in many fields such as animation, shape design and contour reconstruction. Most present algorithms can only morph between topologically similar shapes of which an obvious one-to-one mapping can be easily found between the source and the target. We examine how to morph two polygons into one polygon naturally and reasonably with least user interaction. In this talk, we introduce the basic idea of morphing and present several morphing algorithms. We also explain their difficulties in handling the 2-into-1 morphing problem. In order for two objects to morph into one. they must first morph until they touch. we call this the osculation problem. We will discuss a few promising methods to solve this problem.

AN APPLICATION OF GIS FOR RISK ANALYSIS AND ROUTING OF HAZARDOUS MATERIALS.

Samina T. Panwhar. Dept. of Civil and Environmental Engineering, University of Alabama at Birmingham, Birmingham, AL 35294-4440.

This research presents the development and a simple demonstration of a geographic information system (GIS) based hazardous waste transportation system that is intended to reduce the impact of potential incidents regarding hazardous waste shipments through an urban area. This methodology uses a probabilistic risk assessment framework, which takes into account the probability of accidents for each road segment and the consequences of an accident as route selection parameters. Vulnerability of the facilities like schools, daycare centers, hospitals etc, is calculated as a reciprocal function of the distance of the facilities from the transportation routes and the population of the vulnerable facility. The system uses ArcView 3.2 GIS to perform spatial analyses to assist the optimization procedure. Network analyst 1.0b, an extension of the ArcView GIS, is used as a 'best routing' engine to calculate the safest route for the transportation of hazardous materials. The system is written in Avenue scripting language, which is the built-in object-oriented language for ArcView. The model calculates the risk for each segment, using a simple set of site conditions, based on the risk analysis model and then using Network Analyst. The model then selects the optimized route for transportation of hazardous materials. This model demonstrates how different parameters can be easily modified to reflect specific attributes of each risk element.

SURFACE PREPARATION FOR CONTACTS TO GaN.

Harvey P. Hall and Kalyan K. Das, Dept. of Electrical Engineering, Tuskegee University, Tuskegee, AL 36088.

Electrical contacts to GaN films have been studied and characterized with the objective of understanding contact formation and realizing low resistance metal contacts. Contact properties are known to be strongly related to surface preparation. It appears that the as-received material had a thin oxide film on the surface of the GaN film. Various cleaning treatments were employed in order to render the surface contamination free and removal of the oxide film. Metal films were then deposited by e-beam evaporation. Electrical characteristics of these contacts indicated that the optimal treatment was an organic solvent cleaning followed by etching in a buffered oxide solution. Contacts established with Al were observed to be ohmic in nature, whereas Au, Cr, Ti and Pt exhibit rectifying contacts. Platinum contacts were almost ideal as shown by an ideality factor of 1.02.

BUILDING THE VISIBILITY GRAPH OF CIRCLES.

BUILDING THE VISIBILITY GRAPH OF CIRCLES. Yaohui Lu and John K. Johnstone, Dept. of Computer and Information Sciences, University of Alabama at Birmingham, Birmingham, AL, 35205. luy@cis.uab.edu

We present a method for building a visibility graph for an environment of circular obstacles. For polygonal obstacles, the nodes of the visibility graph are the vertices of these polygons, and two nodes are connected by an edge if the corresponding vertices can see each other. For circular obstacles, the vertices of the visibility graph are the points of tangency of the common tangents between two circles. The endpoints of these common tangents split the boundaries of the circles into a sequence of arcs. The edges of the visibility graph split into two categories. The first category is edges between vertices that see each other (an edge that does not intersect any circle). The cost of these edges is simply their Euclidean distance. The second category consists of edges between two neighboring vertices on the same circle. The cost of these edges is the arc length of the circle between the vertices. The common tangents of two circles are computed using inversion and the polar of a circle. The complexity of the basic method is $O(n^2)$. We will discuss the use of Welzl's view relation to improve the efficiency of the method.

IMPLANTED P-N DIODES IN Si/Ge. Mohammad D. A. Mazumder, Harvey P. Hall, Nazmul Habib and Kalyan K. Das, Dept. of Electrical Engineering, Tuskegee University, Tuskegee, AL 36088.

P-N junction diodes were fabricated on samples obtained from two different wafers; (1) a complete HBT structure with an n (Si emitter), p (Si/Ge base), and an n/n+ (Si collector/sub-collector) deposited epitaxially (MBE) on a high resistivity p-Si substrate, (2) an HBT structure where epitaxial growth was terminated after the p-type base (Si/Ge) layer deposition. Two different process runs were attempted for the fabrication of Si-Si/Ge (n-p) and Si/Ge-Si (p-n) junction diodes formed between the emitter-base and base-collector layers, respectively, of the Si-Si/Ge-Si HBT structure. One of the processes employed a plasma etching step to expose the p-layer in the structure (1) and to expose the e-layer in structure (2). The contact metallization used for these diodes was a Cu-based metallization scheme. The plasma-etched base-collector diodes on structure (2) exhibited well-behaved diode-like characteristics. However, the plasma-etched emitter-base diodes demonstrated back-to-back diode characteristics. These back-to back characteristics were probably due to complete etching of the base-layer, yielding a p-n-p diode. The deep implantation process yielded rectifying diodes with asymmetric forward and reverse characteristics. The ideality factor of these diodes were between 1.6 -2.1, indicating that the quality of the MBE grown epitaxial films was not sufficiently high, and also incomplete annealing of the implantation damage. Further study will be conducted on CVD grown films, which are expected to have higher epitaxial quality.

URBANIZATION AND THE CAHABA RIVER. <u>Cari DeVaney Ray</u>, Dept. of Civil and Environmental Engineering, University of Alabama at Birmingham, Birmingham, AL 35294

The Cahaba River is the source of drinking water for several hundred thousand people in the Birmingham metropolitan area. The city of Birmingham is still growing with new malls and golf courses appearing seemingly daily. The growth is good from an economic standpoint, but urbanization is adding pollutants to the water that can cause serious health problems if not treated before drinking. Fertilizers and chemical s exiting the wastewater treatment plants along with stormwater runoff will lead to the degradation of the drinking water supply and will impact the rich aquatic life of the river. Already, several species in the river are listed as 'endangered' or 'threatened'. This project was undertaken in order to assess the chemical quality of the Cahaba and Little Cahaba Rivers. The parameters tested included ammonia, conductivity, nitrate, sulfate, phosphate, turbidity and pH. It appears that urbanization is impacting the Cahaba River and thus the drinking water source for a large percentage of the Birmingham metropolitan area, especially through the runoff entering the river during rain events. These impacts of urbanization make this surface water more difficult to treat and therefore more expensive to treat. The concentration of several of these pollutants in the river indicate that if the treatment were to fail when the river concentrations are high , there is a risk that the consumers could be exposed to pollutants harmful to their health. Protection of the drinking water sources should be a concern and certainly is a public health issue.

THE MOBILE AGENT IN DISTRIBUTED APPLICATIONS. <u>Fei Cao</u>, Dept. of Computer and Information Sciences, Univ. of Alabama at Birmingham, AL 35294-1170, caof@uab.edu.

Mobile agents are programs that can migrate from host to host in a heterogeneous network at times and to places of their own choice. The state of the agent is saved, and then transported to new host , where the state is restored and the agent interacts with stationary service agents and other resources . The agent paradigm provides a single infrastructure in which a wide range of distributed applications can be implemented and is a easy to understand by software developers. It saves bandwidth, support dynamic deployment and disconnected operation ,and reduces latency. With the dramatic increase in the number and power of mobile devices, mobile agent technology will become more widely used. However, agents are often written in a relatively slow interpreted language for portability and security reasons. Thus, mobile agents often take longer time to accomplish a task than traditional networking solutions especially when only a few operations are to be performed compared to the resources available. Additionally, current systems do not adequately protect an agent against malicious software, which limits an agent's migration choices. Various kinds of solutions for these two problems are being explored

ELECTRICAL CHARACTERIZATION OF WHITE AND BLUE LIGHT EMITTING DIODES.

Allen M. Lykes, Mohammad D.A. Mazumder and Kalyan K. Das, Dept. of Electrical Engineering, Tuskegee University, Tuskegee, AL 36088.

A comparative study current-voltage (I–V) and capacitance-voltage (C–V) characteristics of GaN blue and white light emitting diode (LEDs) were conducted. The linear plots of the I–V indicated a turn-on voltage of 3.4V for the blue and 3.6V for the white LED. These plots also showed a reverse leakage current of 8.32×10^{-7}A and 2.49×10^{-7}A. Ideality factors for these diodes were obtained from semi-log plots of the forward characteristics. The ideality factor for the blue diode was $4.19 < n < 6.01$ and that for the white diode was $1.23 < n < 4.53$. These results indicate that the diodes were highly non-ideal, the blue diode being more non-ideal than the white diode. Logarithmic plots of these characteristics indicate that the diode currents were space charge limited in the presence of deep-level states. An analysis of the capacitance-voltage results indicates that the diodes at a bias of 8V-12V are linearly graded junction; however, at higher voltages the junction appears to be a step junction. At very low voltages the log C–log V plot deviates significantly from the true linearly graded approximation. Assuming that this deviation was due to the presence of charged deep-level recombination centers in the depletion region and of opposite polarity from the regular space charge, a value for deep-level states were calculated as 1.37×10^{16}, 5.5×10^{14} for the blue and the white diode, respectively.

RUNNABLE NATURAL LANGUAGE SPECIFICATION USING TWO LEVEL GRAMMAR*.

Beum-Seuk Lee, Department of Computer and information Sciences The University of Alabama at Birmingham Birmingham, Alabama, U.S.A. 35294-1170.

In software engineering there have been very few attempts to automate the translation from a requirements document written in a natural language (NL) to one of the formal specification languages. One of the major reasons for this challenge comes from the ambiguity of the NL requirement documentation because NL depends heavily on context. To make a smooth transition from NL requirements to one of the formal specification languages we need a specification that can mediate these two domains of different formalism level. We used Two-Level Grammar (TLG) to construct a bridge between a NL requirements specification and a formal specification (in our case the Vienna Development Method - VDM). TLG is the most NL like specification language which is a unification of functional, logic, and object-oriented programming styles. A knowledge base of the syntactic and semantics information from the NL requirements documentation is built using contextual NL processing before translating it into TLG. This translated TLG is translated in turn into VDM which can be executed. We overcome the challenges of the ambiguity in NL without losing its flexibility using the contextual NL processing and TLG.

PARALLEL AND DISTRIBUTED PROGRAMMING ON TOP OF VIA.

Yibing Wang, Department of Computer and Information Sciences, University of Alabama at Birmingham, Birmingham, AL 35205

Virtual Interface Architecture (VIA) was proposed as a broad band networking solution for system area networks (SANs). VIA was also specified to provide a Consumer Layer, which supports operating-system-level (OS-level) communication interfaces such as Sockets and Message Passing Interface (MPI). One problem with the commercial VIA product that we have was that the provider's implementation of the VIA Consumer Layer was incomplete. Other architectural problems were also found when we tried to port Parallel Virtual Machine (PVM) to a Beowulf Cluster that has VIA networking facility. Those problems include the lack of OS-level support for multiplexing and multiprocessing, which are critical for general-purpose parallel and distributed applications. To address the problem of incomplete VIA Consumer Layer, a small library has been built to simulate TCP/UDP Socket APIs in our research project. As to the architectural problems, we propose the combination of a new Virtual-Machine (VM) Agent and the VIA Agent to be part of the operating systems for Clusters. The VM Agent extends the concept of the existing PVM daemon with enhanced load-balance mechanism and parallel I/O. The combination and related APIs support both distributed and parallel programming on top of VIA.

REUSABILITY IN CODE GENENERATION FROM UML.

Song Zhou, Dept. of Computer & Information Sciences, Univ. of Alabama at Birmingham, Birmingham, AL 35294-1170, zhous@cis.uab.edu.

The Unified Modeling Language (UML), as an industrial standard for object-oriented modeling, is supported by many commercial modeling products. However reusability in code generation is not highlighted in those products. There are three categories of reusability during code generation: 1) Source component reuse. Before the semantics of UML is precisely defined, it is still not practical to reuse classes generally. Currently source code reuse is possible for some specific application domains and some common constructs, such as Set, Enumerator. 2) Design pattern reuse. Design patterns are utilized to provide reusability during system design. Templates for design patterns can be reused during code generation, forming the basis of an instantiated design pattern. 3) System level reuse. Reusability during software evolution is meaningful. If changes in the requirements are not great, most modules of the old system may be reused when generating the new system.

EXPERT SYSTEM ON DIAGNOSIS FOR MACHINING ERROR SOURCES WITH FUZZY THEORY.

Xidong Zheng, Dept. of C.S., Univ. of Ala. @ Birmingham, 820-18th Street S., Apt# 306, Birmingham, AL, 35205.

Traditional Expert System uses definite rules and knowledge as its knowledge base. While in some other cases where the rules cannot be represented as definite knowledge sets, so the system should simulate the human being's natural language to fill its knowledge base. Thus we use the fuzzy rules in the expert system to solve this problem. In our specific system, the use of fuzzy theory can help the Expert System to simulate the human experts' analysis and diagnosis for machining error. By analyzing the phenomena in the part machining process and reasoning, the cause of machining errors can be gained, according to the experts' knowledge in the system knowledge base. Because the phenomena description in the part machining process is always very fuzzy, we should first use fuzzy theory to describe these phenomena and then get the relationship between error sources and these phenomena as the fuzzy rules. We also formulize the content and path of knowledge for quality analysis and diagnosis, and connote the diagnosis knowledge using the method combining rules and frames, and illustrate the indeterminacy and weight fuzzy relation of error sources with error cause trees. We have established the diagnosis algorithm and the structure of expert system, including the knowledge base, interfaces and reasoning using language PROLOG.
Keywords: Expert System, Fuzzy Theory, Error Sources, Error Diagnosis.

REPORT ON THE GORGAS SCHOLARSHIP COMPETITION, 2001

The Gorgas Scholarship Committee announced the ranking of the finalists in the 2001 Alabama Science Talent Search. The Search was held at the meeting of the Alabama Academy of Science at Auburn University, Auburn, Alabama.

The winner of the first-place tuition grant of $3,000 was

> Ms. Lillian Correa, 252 Pine Ridge Road, Madison, AL 35758. Bob Jones High School, Madison, AL 35758. Teacher – Ms. Jennifer Rountree.

First alternate and winner of a tuition grant of $2,000 was:

> Mr. Bradley Scott Patterson, 821 Fry Gap Road, Arab, AL 35016. Arab High School, Arab, AL 35016. Teacher – Mr. Jim Walley.

Second alternate and winner of a tuition grant of $1,500 was:

> Ms. Erin Elizabeth Robbins, 4921 Stonehenge Road, Birmingham, AL 35242. Jefferson County International Baccalaureate High School, Irondale, AL 35210. Teacher – Dr. Trudy Anderson.

Third alternate and winner of a tuition grant of $1,000 was:

> Ms. Kelly Lee Lamb, 2900 Blackjack Road, Trussville, AL 35173. Jefferson County International Baccalaureate High School, Irondale, AL 35210. Teacher – Dr. Trudy Anderson.

Fourth alternate and winner of a tuition grant of $500 was:

> Mr. Russell Douglas Goode, 7215 Trailwood Street, Florence, AL 35634. Brooks High School, Killen, AL 35645. Teacher – Ms. Vicki Farina.

Fifth alternate was:

> Mr. William Zachary A. Riddle, 408 Seminole Lane, Trussville, AL 35173. Jefferson County International Baccalaureate High School, Irondale, AL 35210. Teacher – Dr. Trudy Anderson.

Sixth alternate was:

> Ms. Elizabeth Munoz Torres, 3506 Greenbriar Drive, Huntsville, AL 35810. J.O. Johnson High School, Huntsville, Al 35810. Teacher – Ms. Melanie Hanson.

Seventh alternate was:

> Ms. Kimberly Bernice Sledge, 2914 Pulaski Pike, Huntsville, AL 35810. J.O. Johnson High School, Huntsville, AL 35810. Teacher – Ms. Melanie Hanson.

Eighth alternate was:

> Mr. Jared Reed Glass, 4905 Holly Lane, Gardendale, AL 35071. Jefferson County International Baccalaureate High School, Irondale, AL 35210. Teacher – Dr. Trudy Anderson.

Ninth alternate was:

> Ms. Sonya Maria Legg, 3211 Clifford Road, Huntsville, AL 35810. J.O. Johnson High School, Huntsville, AL 35810. Teacher – Ms. Melanie Hanson.

Unable to exhibit:

> Ms. Jamie Lynn Aldes, 6033 Cedar Knot Court, Mobile, AL 36609. Murphy High School, Mobile, AL 36606. Teacher – Ms. Wand Griffis.

> Ms. Callie Dawn Cook, 4032 Brookmont Drive, Birmingham, AL 35210. Teacher – Dr. Trudy Anderson.

> Ms. Christopher Edward Lee, 3104 Dahlia Court, Huntsville, AL 35810. J.O. Johnson High School, Huntsville, AL 35810. Teacher – Ms. Melaine Hanson.

> Ms. Sarah Rochelle Smithberg, 3896 Overton Manor Trail, Birmingham, AL 35243. Jefferson County International Baccalaureate High School, Irondale, AL 35210. Teacher – Dr. Trudy Anderson.

> Ms. Elisicia Louise Taylor, 826 7th Street West, Birmingham, AL 35204. Arthur Harold Parker High School, Birmingham, AL 35204. Teacher – Ms. Patricia Davis.

The rankings were established by a panel of judges consisting of department heads, deans and professors from many of the leading universities and industries in Alabama. Winners and finalists in the Gorgas Contest receive offers of tuition scholarships to colleges and universities in Alabama for the study of science. The Gorgas Scholarship Program is named for General William Crawford Gorgas, the Alabama physician who conquered yellow fever in the Panama Canal Zone and later became the Surgeon General of the United States Army. The purposes of the Gorgas competition are to promote interest in science and to aid in the education of promising students.

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INSTRUCTIONS TO AUTHORS

Editorial Policy: Publication of the *Journal of the Alabama Academy of Science* is restricted to members. Membership application forms can be obtained from Dr. Dail W. Mullins, School of Education, Dean's Office, 120 Education Building, University of Alabama at Birmingham; Birmingham, AL 35294-1250, email drdoom@uab.edu. Subject matter should address original research in one of the discipline sections of the Academy: Biological Sciences; Chemistry; Earth Science; Geography, Forestry, Conservation and Planning; Physics and Mathematics; Industry and Economics; Science Education; Behavioral and Social Sciences; Health Sciences; Engineering and Computer Science; and Anthropology. Timely review articles of exceptional quality and general readership interest will also be considered. Invited articles dealing with Science Activities in Alabama are occasionally published. Reviews of recently published books related to any of the discipline sections of the Academy are welcome. Submission of an article for publication in the *Journal* implies that it has not been published previously and that it is not currently being considered for publication elsewhere. Each manuscript will receive at least two simultaneous peer reviews.

Submission: Submit an original and two copies to the editor. Papers which are unreasonably long and verbose, such as uncut theses, will be returned. The title page should contain the author's name, affiliation and address, including zip code. The editor may request that manuscripts be submitted on a diskette upon their revision or acceptance.

Manuscripts: Consult recent issues of the *Journal* for format. Double-space manuscripts throughout, allowing 1-inch margins. Number all pages. An abstract not exceeding 200 words will be published if the author so desires. Use heading and subdivisions where necessary for clarity. Common headings are: **Introduction** (including literature review), **Procedures** (or **Materials and Methods**), **Results, Discussion,** and **Literature Cited**. Other formats may be more appropriate for certain subject matter areas. Headings should be in all caps and centered on the typed page; sub-headings should be italicized and placed at the margin. Avoid excessive us of footnotes.

Illustrations: Submit original inked drawings (graphs and diagrams) or clear black and white glossy photographs. Width must not exceed 15 cm and height must not exceed 20 cm. Illustrations not conforming to these dimensions will be returned to the author. Label illustrations with lettering that will be legible after a 30% reduction. Designate all illustrations as figures, number consecutively, and cite all figures in the text. Type figure captions on a separate sheet of paper. Send two extra sets of illustrations; copied photographs are satisfactory for review purposes.

Tables: Place each table on a separate sheet. Place a table title directly above each table. Number tables consecutively. Use symbols or letters, not numerals, for table footnotes. Cite all tables in the text.

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