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JOURNAL OF THE TENNESSEE ACADEMY OF SCIENCE

VOLUME 58, NUMBER 1 & 2, JANUARY-APRIL, 1983

ABSTRACTS PRESENTED AT THE ANNUAL MEETING

BOTANY SECTION

GORDON HUNTER, *Presiding*

Intelligent Labelmaking For The Herbarium.
V. BATES, JR., Memphis State University

Preparation of herbarium labels is very time consuming and subject to various human errors. Even though it is impossible to prevent all human errors, it is possible to develop an intelligent, computer-assisted procedure that minimizes input from the user. Significant reduction of human input will reduce errors as well as speed up the labelmaking process.

The author has developed a computer program, the LABELMAKER, which attempts to make label preparation a rapid, accurate event. Repetition of entire labels, as well as repetition of certain key fields allows the user to avoid re-entering the same field more than once. Input of state names, generic names, and certain county names are internally checked and flagged when spelled incorrectly. Automatic display of the finished, formatted label can be quickly checked and/or edited before printing. Other features and considerations makes the LABELMAKER an extremely useful addition to the herbarium.

Towards An Atlas Of Tennessee Plants.
V. BATES, JR., Memphis State University

Even though the need for an up-to-date atlas of Tennessee plants has been recognized by many botanists, few have the time and/or resources to adequately approach such a large task. Nevertheless, an atlas is the neces-

Five potential natural landmarks in the Interior Low Plateaus Natural region were evaluated between March, 1982 and October, 1982. Although broadly classified as herb, grass, shrub vegetation types, all were swamps containing excellent woodlands. Sites evaluated were: Anderson Pond, White County, Tennessee; Cedar Hill Swamp, Robertson County, Tennessee; Dawson Springs Seep Swamp, Caldwell County, Kentucky; Greens Bottom, Carroll County, Kentucky; and Mingo Swamp, Franklin County, Tennessee. Site characteristics including location, boundaries and size were determined. Present land use. threats, effects of publicity, and ownership were evaluated and determined. Descriptions were made for geology and ecology including lists of flora. Significance and comparison statements were made for each site. Finally, recommendations were made concerning the designation of sites as National Natural Landmarks. All five sites were recommended for this status.

The Induction of Callus Tissue from the Boston Fern, Nephrolepis exaltata c.v. bostoniensis.
JAMES D. CAPONETTI, The University of Tennessee and THOMAS E. BYRNE, Roane State Community College

Various tissues of the Boston Fern, *Nephrolepis exaltata* c.v. bostoniensis were propagated by sterile culture techniques. The hormone 2,4-dichlorophenoxyacetic acid (2,4-D) and various sucrose combinations were employed to induce callus tissues. Many attempts to initiate callus formation from different tissues failed, with callusing occuring only in the regions of primary and lateral meristems of the stolons. Having established the potential for callus induction, a series of experiments were employed to

Biological Studies In Cannibas In Central Asia.
G. K. SHARMA, University of Tennessee at Martin & S. K. MANN, H. P. University

It is quite generally agreed that *Cannabis* is a native of Central Asia. The plant is found truly wild, cultivated and weedy in that part of the world in a wide variety of habitats along altitudinal and latitudinal gradients. The area is sparsely populated. As a result of the sparse populations and remoteness of the area, truly wild populations of *Cannabis* unaffected or undisturbed by human invasion present an excellent opportunity for biological studies on this taxon. Under the present project, an extensive investigation of *Cannabis* in Central Asia was carried out and combined with ethnobotanical, morphological, anatomical, cytological, and cuticular studies. Ethnobotanical investigations confirmed that *Cannabis* was an embodiment of great reverence in the ancient cultures of the area. The plant exhibited great morphological variations in its natural range. Plant, leaf, flower, and seed size seemed to be affected by topography and other environmental factors. Cuticular features such as stomata, trichomes, glands, and subsidiary cell complex showed significant results.

Notes on the Flora of Tennessee, Particularly of the Northwest Highland Rim.
EDWARD W. CHESTER, Austin Peay State University

The historic and presently-known Tennessee distribution of two species typically found in midwestern prairies and which are part of the prairie flora eastern extension will be discussed. *Rudbeckia subtomentosa* Pursh was first found in Tennessee (Montgomery County) by R. E. Shanks in 1942. There have been no subsequent reports and in 1978 the Committee for Tennessee Rare Plants considered it as possibly extirpated from the state flora. However, it still grows in barrens of both Montgomery (EWC 4204) and Stewart (EWC 81-727) counties. *Silphium laciniatum,* considered a threatened species by the Committee, has heretofore been reported only from Henry and Carroll counties in West Tennessee. A healthy population has recently been found in barrens of Montgomery County (EWC 81-732). Cited collection numbers represent vouchers in the APSU Herbarium.

CHEMISTRY SECTION A

JIMMY H. DAVIS, *Presiding*

The Emission Spectrum of Hg.I.
K. S. VISWANATHAN, O. CARLYSLE SALTER, AND JOEL TELLINGHUISEN Vanderbilt University

The emission spectrum of HgI has been photographed and analyzed, using a Tesla discharge to excite sources containing the single isotopic species, $^{200}Hg^{127}I$ and $^{200}Hg^{129}I$. The prominent electronic transitions are B-X (4000-4450Å), C-X (2900-3080 Å), and D-X (2700-2900Å). Analysis of these band systems yields: (1) A decrease in the previously accepted vibrational numbering of the ground (X) state by one unit; (2) Improved vibrational constants for all four states; (3) A more precise estimate of the ground-state dissociation energy; (4) Information about the relative configuration of potential curves from trial-and-error Franck-Condon calculations; and (5) Qualitative interpretation of the role of spin-splitting through band profile simulations. The spectrum is too congested to permit a rotational analysis, so the absolute internuclear distances (R_e) cannot be obtained. The previously reported laser "lines" in HgI appear to involve a semicontinuous overlap of rovibronic transitions in the several HgI isotopomers occurring in "natural" HgI.

A Mass Spectrometric Study of 1,4-Dioxa-8-azaspiro [4.5] decane.
W.E. SOLOMONS, AND C.W. SPRAGINS, The Univ. of Tenn. at Martin

The mass spectrum of 1,4-dioxa-8-azaspiro [4.5] decane (4-ethylenedioxypiperidine) showed a prominent peak at m/e 87 (the base peak). Ethylenedioxy ketals of cyclic ketones commonly give a fragment of m/e 86 and other fragments of higher mass than 87. A mechanism for formation of a m/e 87 fragment was formulated and evidence for this mechanism and for the structure of the fragment was obtained by deuterium labelling. Structures and mechanisms of formation of other major fragments were also studied.

Interfacing a Microdensitometer to a Microcomputer
O. CARLYSLE SALTER AND JOEL TELLINGHUISEN, Vanderbilt University

In methods of photographic spectroscopy there is a need for precision measurement of a large amount of experimental data—the positions and intensities of rotational lines, vibrational band heads, and calibration lines on the photographic plate. Microdensitometers and optical comparators permit one to measure the positions of sharp features with a precision of 1-2 μm; however, the procedure of measuring, recording, and logging the data for computer processing is very tedious and time consuming. To speed up this part of our work, we have interfaced a microdensitometer to a TRS-80 Model III microcomputer equipped with hardware to control the motion of the plate and to log the optical density in digital form. The cost of the equipment is ~$2500 (microcomputer included), which is modest in comparison with the cost of the microdensitometer. In this paper we discuss various aspects of the interfacing task, including hardware and software for stepping motor control and analog-to-digital conversion.

Nuclear Magnetic Resonance of Surfactants Adsorbed by Flocs.
WILLIAM ABRAHAM AND DAVID J. WILSON

Adsorption of linear long chain alkyl sulfates and phosphates on freshly precipitated $Al(OH)_3$ is investigated by means of proton and natural abundance C-13 nuclear magnetic resonance spectroscopy. The problem of weak signals is readily overcome by Fourier transform techniques and spectrum accumulation. An attempt is made to measure spin-lattice relaxation times (T1) of the various C and H atoms in the hydrocarbon chains. Broadening of the peaks indicates less motional freedom of the surfactant molecules in the bound state. Preliminary data seem to favor the model for binding of the surfactants in which the methylene groups nearest to the polar end are less free to move than those farther away from the polar head. The broad signals also indicate that the motion of the bound surfactant molecules is more restricted than it is for molecules in micelles.

A Study of the Partial Molal Volumes in Selected Binary Systems
S. K. AIREE & PAULT. RICHARDSON, The University of Tennessee at Martin

Partial molal volumes for five different groups of solutions using water as the solvent were determined. Using CRC HC&P data and a BASIC computer program to calculate and plot, trends in a series of Group I and II chlorides and several potassium halides were recognized and interpreted and compared to corresponding electronegativities and ionic radii. Solvent-solute interaction and the degree of hydration seemed to play a significant role. Temperature dependance of data for sodium chloride and trichloroacetic acid solutions was compared. Other compounds examined were: methanol, ethanol, formic acid and acetic acid.

Theoretical Vibrational Spectra of Thiirene and Thiirane.
W. D. ALLEN, B. A. HESS, JR. AND L. J. SCHAAD, Vanderbilt University

Optimum geometries and theoretical IR spectra have been computed with 3-21G and 6-31G* basis functions for the stable molecule thiirane and for the highly reactive thiirene. Agreement with experiment is good for thiirane but less satisfactory for thiirene where both experimental and theoretical spectra are more questionable. The C-S stretching frequency appears particularly difficult to calculate in the unsaturated system.

CHEMISTRY SECTION B

CHARLES E. HARDING, *Presiding*

Heats of Combustion and Partial Molal Volumes of Solutions of Ethanol and Isooctane or Heptane.
S. K. AIREE, LANIS B. HENRY AND ROBB MITCHELL, The University of Tennessee at Martin

Heats of combustion were determined for a series of solutions of ethanol and iso-octane or n-heptane. Computer programs were written and utilized to generate values of heats of combustion per unit volume (liters, gallons, . .) besides per mole or per gram using the combustion data for pure components and density measurements of solutions. Using another program, partial molal volumes of ethanol in various solvents were calculated and compared. The concentrations were determined using the refractive index calibration curves. The comparison of the calculated and experimental values of the heats of combustion for mixtures seemed to show no apparent solute-solvent interaction.

Partial Purification and Characterization of Glutamate Dehydrogenase in Bacillus subtilis.
J. M. WAKIM, The Univ. of Tenn. at Martin and J. F. KANE AND R. FISHER, UT Center for Health Sciences

There are conflicting reports in the literature concerning the presence of glutamate dehydrogenase in *B. subtilis.* Glutamate dehydrogenase was found in several strains of *B. subtilis.* The growth conditions were found to control the amount of glutamate dehydrogenase elaborated by the microorganism. Glutamate dehydrogenase from one strain of *B. subtilis* was purified approximately 250 fold. This protein preparation exhibited heterogeneity by SDS electrophoresis. The partially purified protein was used in this study to determine some kinetic properties of the enzyme. Substrate speceficity, optimal concentration and inhibition were ascertained. Also, the bacillus enzyme is compared with glutamate dehydrogenases from other sources.

The Emission Spectrum of HgBr.
J. GAIL ASHMORE AND JOEL TELLINGHUISEN, Vanderbilt University

The B-X (4200-5100 Å), C-X (2700-2950 Å), and D-X (2480-2700 Å) emission transitions of HgBr have been photographed and analyzed for isotopically pure $^{200}Hg^{79}Br$ and $^{200}Hg^{81}Br$. The analysis yields improved

vibrational constants and potential curves for all four states, and the first determination of rotational constants and internuclear distances in the X and B states. The improved spectroscopic constants permit a more reliable assignment of previously reported features in the spectrum of the HgBr visible laser. Efforts are presently underway to (1) measure collisional line broadening for selected rotational lines using the very high resolution of a Fabry-Perot interferometer, and (2) determine the R-dependence of the electronic transition strength function from analysis of intensity data.

The Transannular Cyclization of Cyclodecyn-6-one.
CHARLES E. HARDING, The Univ. of Tenn. at Martin

Cyclodecyn-6-one can be rearranged under a variety of conditions to give an isomeric α,β-unsaturated octalone as the only product. Conditions for the rearrangement will be discussed. Oxygen-18 studies have been completed and indicate that the reaction may proceed through an unstable oxete derivative as an intermediate. Results of attempts to cyclize the ketone by photochemical and by thermal reactions will also be discussed.

The Use of Morse-RKR Curves in Diatomic Calculations.
STUART D. HENDERSON AND JOEL TELLINGHUISEN, Vanderbilt University

The emission and absorption spectra of heavy diatomic molecules are usually rotationally congested, so that it is difficult or impossible to achieve a rotational analysis, even though a vibrational analysis may be straightforward. For the calculation of important properties of the transition, one requires potential curves for both states. The standard method for obtaining such curves is the Rydberg-Klein-Rees (RKR) method. However, in the absence of rotational constants in the RKR method can yield only the *width* of the potential, R_+-R_-, as a function of v and G_v. Thus to obtain a suitable potential in such cases it is necessary to *guess* the internuclear distance and the shape of either the inner or outer branch of the potential.

We find that the simple Morse curve does a surprisingly good job of representing the inner branch of the potential. Results of test calculations on 25 well-known diatomics are reported.

Hydrogen Shuttling with 9,10-Dihydrophenanthrene.
EUGENE A. KLINE AND MARK E. HARRISON, Tennessee Technological University

H-Donors are traditionally used in providing hydrogen to radicals produced in thermal homolytic cleavages of the coal molecules. The use of dihydrophenanthrene has been found to transfer hydrogens from one organic molecule to another and may have important implications to coal liquefaction processes. Various other H-donors will be compared.

Solvent Sublation of p-Dichlorobenzene.
CARL SCHNEIDER, JOSEPH L. WOMACK, KALLIAT T. VALSARAJ AND DAVID J. WILSON, Vanderbilt University

Solvent sublation, a surface chemical separation technique, was used to remove p-dichlorobenzene from water in a small pilot plant operated in the batch mode. (This compound was used as a model for more highly toxic chlorinated organics such as PCB's and chlorinated hydrocarbon pesticides.) A high-speed algorithm was developed for modeling the operation of batch and continuous-flow solvent sublation columns, and this was used to interpret the experimental results obtained. Solvent sublation shows some promise for the removal of trace levels of hydrophobic organic compounds (pesticides, PCB's, polynuclear aromatics, etc.) from industrial waste-waters.

Methylation of Sterically Hindered Quinols Using Phase-Transfer Catalysis.
MARTIN V. STEWART, MICHAEL D. RICHARDSON, SHARON A. CHURCHILL, AND RON A. KIRSCH, Middle Tennessee State University

Various 1,4-dimethoxybenzene derivatives, employed here as starting materials for other synthetic work, are routinely prepared from the corresponding quinol through the ordinary Williamson route in homogeneous solution. However, attempted methylation of 2,5-di-*t*-butyl-1,4-hydroquinone with dimethyl sulfate in aqueous sodium hydroxide affords a mixture that contains both the quinone and quinol ether dimer as major components. When this same reaction is conducted under a nitrogen atmosphere in a methylene chloride—water system below 10° using benzyl-tri-*n*-butylammonium chloride as a phase-transfer catalyst, the desired 2,5-di-*t*-butyl-1,4-dimethoxybenzene is isolated after two hours in high purity and in nearly quantitative crude yield. Significant amounts of 2,5-di-*t*-butyl-1,4-quinone is obtained as the only by-product if the precaution of an inert atmosphere is not employed. Thus, the conditions of phase-transfer catalysis appear to inhibit the formation of the phenoxy radical precursor of the coupling by-products. Acknowledgment is made to the donors of The Petroleum Research Fund, administered by the American Chemical Society, for support of this research.

Migration of Pollutants in Groundwater. II. Adsorbable Pollutants and Numerical Dispersion Reduction.
KENNETH N. CARTER, JR., MELIO SAENZ, AND DAVID J. WILSON, Vanderbilt University

We discuss here the partial differential equations governing the migration of a decomposing pollutant absorbing according to a Langmuir isotherm and undergoing 2-dimensional flow in a saturated aquifer. The equations governing the mass transfer of the pollutant to the surfaces within the aquifer are solved in closed form, permitting the use of larger values of the time increment Δt in the numerical integration of the dispersion-advection equation governing the behavior of the dissolved pollutant. In this numerical integration transverse numerical dispersion is eliminated by using conformal coordinates (velocity potential and stream function), and longitudinal numerical dispersion is very substantially reduced by use of an asymmetrical 4-point formula to represent the advection term. Some representative results are given as contour maps. The mass transfer rate coefficient is estimated as the least positive eigenvalue of a diffusion problem.

ENGINEERING SECTION

HALL G. ROLAND, *Presiding*

Separation of Asbestos from Other Particulates by Zonal Centrifugation.
W. P. BONNER, R. B. BUSTAMANTE AND C. W. ISHAM, Tennessee Technological University

The purpose of the research was to demonstrate the degree of separation of asbestos from particulates in air, minerals and other environmental media.

Both natural and artifically prepared samples containing chrysotile and amosite were subjected to density gradient zonal centrifugation. The separation and recovery of asbestos was evaluated by weight and photomicrographic techniques.

The results showed that greater than 95 percent of the chrysotile and amosite could be separated from ambient air particulates and mineral ores.

Concentration of Ethanol Solutions Using a Column Packed with Crushed Glass.
HSIAO-FENG YUAN AND D. W. YARBROUGH, Tennessee Technological University

The use of crushed glass as packing in a column for the separation of ethanol and water has been studied experimentally. The column height equal to an ideal stage, HETP, was determined to be in the range 42 cm (1.4 feet) to 76 cm (2.5 feet). Correlations of HETP with liquid flow rate, relative volatility, and liquid phase properties have been obtained. The laboratory data shows that ethanol solutions can be concentrated from 10 wt % to 90 wt % with five feet of packing. A small scale economically constructed processing unit has been designed.

Monte Carlo Calculations of the Radiation View Factor for Spheres.
CHONLIN LEE AND D. W. YARBROUGH, Tennessee Technological University

The calculation of view factors for surfaces exchanging energy by radiation requires evaluation of a four-fold integral. Analytical results are available for a few surfaces and numerical techniques have been applied in a number of cases. Monte Carlo integration represents a powerful technique that can yield accurate values for the view factor. Monte Carlo calculations have been completed for energy exchange between non-intersecting spheres with separation between centers ranging from zero to eight times the diameter of the larger sphere. Extension of the analysis to non-spherical shapes has been undertaken.

GEOLOGY SECTION

TOM MCCUTCHEON, *Presiding*

Three-Dimensional Geometry of the World Deep Earthquake Zones.
JER-MING CHIU, Tennessee Earthquake Information Center, Memphis State University, and BRYAN L. ISACKS AND RICHARD K. CARDWELL, Department of Geological Sciences, Cornell University, Ithaca, N.Y.

Computer graphics techniques are used to portray the shape of the subducted lithosphere as seen from different views. The configuration of the subducted lithosphere is represented by a surface which fits approximately the upper envelop of the slab-like spatial distribution of earthquake hypocenters in the Benioff zone. Regions considered include the Tonga-Kermadec, the Izu-Bonin-Mariana, the Japan-Kurile-Kamchatka, the Sunda-Banda and the Peru-Chile. These regions include all known zones of deep focus earthquakes except those tectonically complex areas of the New Hebrides, the Solomon-New Britain, the Molucca Sea, and the Mediterranean. Shown at the same scale and with the effect of earth's sphericity included, the views are very useful for illustrating variations in the configuration of the subducted lithosphere between different regions and within the same region. The results illustrate the segmentation of the upper several hundred kilometers of subducted lithosphere into major units of relatively uniform configuration. These segments are also clearly defined by major features of the surface morphology of the trench and upper plate, the

distribution of subduction related volcanism, and by the intersection with the subduction zone of major bathymetric feature of the subducting plates. In contrast the deeper portions of the slabs have a more complex and variable configuration. Discordances between the deep and shallow structure are often important on a regional scale and suggests that there are relative horizontal movements between the surface trace of the subduction zone and the material at depth into which the subducted lithosphere is sinking. These relative movements appear to be intimately associated with the tectonic evolution of the region, and indicate a regional aspect of subduction which is often overlooked in attempt to explain the global variability of the shapes of subducted lithosphere. Although earthquake activity ceases at 680 km possible due to a phase transition, the geometry of deep portion of subducted lithosphere shown that lithosphere does penetrate this depth.

Springs in Cheatham County, Tennessee.

ELLEN R. CRAWFORD AND D.M.S. BHATIA, Austin Peay State University

In 306 square miles of Cheatham County, 36 perennial springs have been located, mapped, and studied to determine their size, estimated water flow, history, and possible future use.

Based on the observations of water flow, depth and width of reservoir, there are 3 large, 8 medium, and 25 small size springs.

The springs emerge in the lower part of the Fort Payne formation. The water quality varies from the clear and normal to a type that is abnormally rich in sulfur and iron compounds. The clear and normal water is being used for domestic and/or agricultural purposes. The sulfur and iron-rich water was responsible for some colorful history and for the establishment of three flourishing health spas and resorts in the mid 1800's and early 1900's.

Pleistocene Mollusca From Ballard County, Kentucky.

A. L. CLARK, Murray State University

This is a paleoecological study of gastropods collected from the Peoria loess near Wickliffe, Kentucky. The gastropods are dominantly terrestrial forms whose presence suggest the habitat was a low-lying, moderately wet and forested area at the time of deposition of the loess.

Geologic Hazards Resulting from Flash Flooding in Southeast Tennessee and Northwest Georgia.

ROBERT L. WILSON, Univ. of Tenn. at Chattanooga

On the evening of August 17, 1982 a unique set of meterological conditions developed over portions of southeast Tennessee and northwest Georgia. The resulting low pressure trough stagnated over the area produced excessive amounts of precipitation. Eleven inches of rain fell in a 12-hour period in parts of Marion and Hamilton Counties, Tennessee and Dade County, Georgia.

The ensuing flash floods caused over 2 million in property damage and resulted in 3 deaths. The area of heaviest precipitation was delineated by a series of mud and rock slides which originated along the steeper slopes of the Cumberland Escarpment. In historic times destruction of this magnitude had never been witnessed. This study documents the results of this devastation and makes certain recommendations for preventative measures which may be of assistance in future such occurrences.

Cyclic Deposition in the Monteagle Limestone.

DAVID N. LUMSDEN, BARRY J. REID, C. DARREL NORMAN, AND PHILLIP G. GREGORY, Memphis State University

Correlation of 79 density logs of wells in Morgan, Scott, and Fentress Counties coupled with study of 3 outcrops near Cookeville (west of the subsurface area) and 1 near Jellico (east of the subsurface area) suggest that 8 to 10 lithologic cycles comprise this unit. These cycles can be tentatively correlated for 40 miles along a N-S outcrop line and over an area of nearly 1500 square miles suggesting eustatic control of sea level. The cycle starts with a fossiliferous packstone-grainstone, passes upward into an oolitic grainstone and is capped by a variety of micrite dominated lithologies (wackestones, dolomicrites, etc.). Isopachous maps of net thickness and porosity show NNE-SSW trends indicating that this was the direction of tidal currents that formed the oolite shoals.

MEDICAL SCIENCES SECTION

DENISE I. PAV, *Presiding*

Pharmacokinetics of Propranolol in Pregnant Rabbits.

MARVIN C. MEYER AND MARTIN YAU, University of Tennessee Center for the Health Sciences

The effect of pregnancy on the pharmacokinetics of propranolol was studied in rabbits. Blood samples were obtained from four 28-day pregnant rabbits which received propranolol HCl by intravenous infusion. The propranolol concentration-time profiles in blood and plasma were determined using a sensitive HPLC assay with fluorescence detection.The hematocrit and protein concentration were also measured. One month after delivery of the fetuses the experiments were repeated.

The propranolol plasma concentrations were found to be almost 100% higher in pregnant rabbits, which also showed a significant ($p<0.05$) decrease in apparent volume of distribution and total body clearance. This dramatic increase in propranolol level was not observed in the blood profiles of the pregnant rabbits. The blood/plasma concentration ratio increased from 0.95 ± 0.03 during pregnancy to 2.02 ± 0.10 in non-pregnant rabbits. In addition, the red blood cell/plasma (RBC/P) concentration ratio also increased from 0.92 ± 0.17 to 3.82 ± 0.38. The lower RBC/P ratio suggested a decrease of propranolol uptake by the red blood cell during pregnancy.

Response of *Salmonella Typhimurium Mutants to* Δ9-THC and in Conjunction with Known Mutagens.

R. D. BLEVINS* AND M. S. SHELTON, East Tennessee State University

Delta-9-tetrahydrocannabinol (Δ9-THC) either alone or in conjunction with known mutagens was investigated for either excitatory or inhibitory effects on the mutation rate of *Salmonella typhimurium* LT2 strains TA1538, TA1537, TA1535, TA100 and TA98 in the standard Salmonella/microsomal testing system.

The Salmonella strains were subjected to non-toxic concentrations of Δ9-THC in conjunction with three known mutagens and one promutagen that are routinely used as positive controls in Salmonella/microsomal testing. The mutagens were 4-nitro-o-pehnylene diamine for strains TA1538 and TA98, sodium azide for strains TA1535 and TA100, and 9-aminoacridine for strain TA1537; the promutagen was 2-amino-anthracene for all five bacterial test strains. A growth study was performed in establishing the toxicity of Δ9-THC and its dose-dependency.

Results showed that in Salmonella strains TA1538 and TA100 Δ9-THC treated experimental values were significantly lower than the non-Δ9-THC treated positive control values. Thus Δ9-THC had a diminishing effect on the induced mutation rate in these two strains. The results when utilizing the other three Salmonella strains TA1537, TA1535, and TA98 indicated some repression of mutation rate, depending on the concentration of Δ9-THC being employed. However, the results obtained for these three strains were not statistically different from the positive non-Δ9-THC treated control values.

Effects of Delta-9-THC on Electrical Self-Stimulation of the Brain in ICR Mice.

R. DEAN BLEVINS AND WILLIAM STANLEY, East Tennessee State University

The effects of various doses of Delta-9-tetrahydrocannabinol (Delta-9-THC) were studied in female International Cancer Research (ICR) mice using the shuttlebox paradigm for electrical self-stimulation of the brain (EBS). Interperitoneal (IP) injections of Delta-9-THC were given twenty minutes prior to placing the mice in the shuttlebox. These injections of Delta-9-THC were shown to have an effect on OFF times, while having no appreciable effect on the ON times. The results of this study and explanation of these results are made within this paper.

Evaluation of a CK-MB Radioimmunoassay Procedure by Comparison with Electrophoretic Method for MB-Isoenzyme of Creatinine Kinase.

SUSAN COX, TIMOTHY LOCKEY, PAMELA T. OSBORNE AND B. R. JENNINGS. Department of Pathology, UTCHS, Clinical Immunology and Chemistry, City of Memphis, Hospital.

The use of the CK-MB Isoenzyme of Creatinine Kinase to confirm acute myocardial infarction has increased rapidly in recent years. The electrophoretic method for quantitation is time-consuming, relatively insensitive and suffers from specificity problems in clearly defining CK-MB levels not influenced by CK-MM, CK-BB, IgG complex or atypical CK. The immunoradiometric assay (Embriar) utilizes a solid phase anti-CK-B as a primary immunosurbent to bind CK-MB and CK-BB. This is followed by a radioactive anti-CK-M. This technique virtually eliminates the possibility of false positive determinations due to brain or muscular trauma or undefined presence of elevated CK-BB, CK-MM or other cross reactants.

Serum specimens were evaluated to diagnose or rule out MI. The following determinations were performed and compared (A) CK-MB Ria(Embria) (B) CPK and LOH Isoenzymes by Electrophoresis. Data obtained was analyzed for (A) Correlation of results by electrophoretic and Ria methodology (B) Correlation of results with patients clinical picture (C) Turn-around time involved.

Fluorescent Antibody Testing on Urinary Sediment.

TIMOTHY LOCKEY, SUSAN COX, VICKIE BASELSKI AND B. R. JENNINGS. Dept. of Pathology, UTCHS and Clinical Immunology and Microbiology, City of Memphis Hospital.

The Antibody-Coated Bacteria Test (ACB) was begun at this institution in 1981 and we have over the past year compiled data on approximately 50 patients. The test works on the premise that bacteria from the urinary sediment of patients with a bladder infection is not coated with antibody but sediment from a kidney infection will have antibody coating. The surface of the bacteria that can be seen by fluorescent microscopy after a fluoresein conjugated anti-human globulin has been applied. The primary

usefulness of this test is its ability to determine whether a known urinary tract infection is of a simple lower tract variety or a more complex upper tract infection. Prostatic or invasive bladder disorders will produce positive results in addition to upper renal infections adding to the considerations and implications of a positive analysis. The test is simple to perform, can be accomplished in less than one hour.

Comparative Evaluation of Microagglutination Kits for Tetanus Anti-Toxin Determinations.

B. R. JENNINGS, ALEX FEDINEC, TIMOTHY LOCKEY, SUSAN COX, MARGARET MOFFATT AND VICKIE BASELSKI. Dept. of Pathology, UTCHS and Clinical Immunology and Microbiology, City of Memphis Hospital.

In conjunction with the World Health Organization Tetanus Prophylaxis program, we evaluated 3 European commercial kits for measuring Tetanus anti-toxin. All kits were erythrocyte agglutination tests performed in microtiter trays.

Fifteen serum samples were provided by the World Health Organization. These sera were titrated in accordance with the various protocols and reagents provided in the kits and the results correlated. The various titers were expressed in international units per milliliter.

Analysis of the results indicate that 3 tests were adequate to detect immunity to tetanus. Variations in the absolute amounts of antitoxin determined by the test was considerable.

Blastema Tissue of Regeneration as a Model for Fetal Alcohol Syndrome.

LEONARD ROBERTSON AND DENISE PAV, East Tennessee State University

Many studies of drug-induced phenomenon in embryos have been compromised by the well documented effects of stress incurred as the inevitable results of pre-partum embryo removal. Our study attempted to circumvent this problem by using a system of drug-tissue interaction in a rabbit which could be observed with a minimum amount of trauma. We measured growth parameters and histological differentiation in a readily accessible wound to the ear. Those rabbits on a diet which included 12% ethanol on demand showed a marked histological alteration in regeneration. The inner cartilage layer of the ear was found to be sensitive to disturbance by ethanol during blastema regrowth.

Periostitis and Osteomyelitis Amoung Prehistoric American Indians From Middle Tennessee.

HUGH E. BERRYMAN, University of Tennessee Center for the Health Sciences

The incidence of periostitis and osteomyelitis is examined in a prehistoric skeletal series from the Averbuch site. The Averbuch inhabitants were agriculturalists that occupied the Nashville Basin during the fifteen century AD. The anatomic distribution and frequency of these lesions will be compared between the sexes and the factors (i.e., poor hygiene, malnutrition, trauma) responsible will be discussed within a biocultural framework.

The Effects of Lindane on the Hypnotic Action of Ether and Catecholamine Levels in the Brain of ICR Male Mice.

ALEXANDER C. WELLS, SR. AND ALPHONSO JONES, Tennessee State University.

A study of the effects of lindane administration on the hypnotic action of ether and brain catecholamine levels in adult Swiss albino male ICR mice, 20-25 gram body weight, has been investigated. Varying dosages of lindane were given to groups of mice orally pursuant to prior i.p. administrations of either atropine sulfate or atropine methyl bromide. Dose range for the lindane was 10-150 mg/Kg. Following administration of the lindane 0.4 cc of ether was given by inhalation and the time from the loss of righting reflex to return of righting reflex and brain catecholamine levels were determined in the individual mouse. Control animals were hydration controls. The time sequence of drug administration, measured in time before giving the ether was as follows: Atropinium agent (40 minutes); lindane (20 minutes); and ether (0 minutes). The results obtained appear to show that lindane, given pursuant to atropine sulfate extends the depressing action of ether. Dopamine levels decreased, while norepinephrine did not change significantly. When atropine methyl bromide was used in place of atropine sulfate, the loss of righting reflex was extended, and dopamine and norepinephrine levels increased significantly. These results suggest a CNS locus of action for lindane's moduration of the depressing action of ether.

The Effects of Guthion Combined with Amobarbital on Albumin, Alpha Fraction, Fibrinogen, Gamma Globulins and Loss of Righting Reflex Time.

ALEXANDER C. WELLS, SR. AND DENISE MUSTIFUL, Tennessee State University.

A study of the effects of guthion combined with amobarbital Na on the loss of righting reflex and plasma protein, albumin, alpha fraction, fibrinogen and gamma gloubulins in adult Sprague-Dawley albino male and female rats, 100-210 gram body weight, has been investigated. Varying dosages of guthion were given to groups of mice orally pursuant to i.p. administration of either atropine sulfate or atropine methyl bromide. Dose range of the guthion was 4-8 mg/Kg. Following administration of the guthion, 50 mg/Kg of amobarbital Na was given i.p. and the time from loss of righting reflex to return of righting reflex and blood samples were taken and assayed for plasma protein in the individual mouse. Control animals were hydration controls. Time sequence of drug administration, measured in time before giving amobarbital was as follows: Atropinium agent (60 minutes); guthion (30 minutes); and amobarbital (0 minutes). The amobarbital extends the loss of righting reflex time. This guthion effect was not yielded when atropine sulfate was given in place of the atropine methyl bromide. Guthion administered alone on a long-term basis decreased all plasma parameters observed except the gamma globulins. Amobarbital administered alone decreased plasma fibrinogen and alpha fraction with increasing loss of righting reflex. The data gathered from this investigation was compiled and compared statistically according to R. L. Sokal (1969). The level of significance was established at p values of 0.05 or less. The effects of guthion and amobarbital support a CNS and PNS loci of action in producing these effects.

PHYSICS AND ASTRONOMY

JOHN W. HANNEKEN, *Presiding*

Neutron Radiographic Measurement of H Electrotransport in Pd.

JOHN W. HANNEKEN, Memphis State University, R. BOWEN LOFTIN, University of Houston Downtown College

Application of an electric field to absorbed hydrogen in Pd results in motion of the hydrogen in the direction of the applied field. From the corresponding change in the hydrogen concentration profile, the hydrogen diffusion coefficient D and mobility b can be determined. Using neutron radiography, a photographic image of the sample can be obtained such that the optical density distribution on the radiographic film directly represents the hydrogen distribution in the sample. The neutron radiography for this work was performed at the high resolution neutron radiographic facility at the University of Missouri Research Reactor which has an available thermal neutron flux of 6.3×10^7 neutrons/(cm^2sec.). Values of D and b calculated from neutron radiographic measurements during the electrotransport of hydrogen in Pd at room temperature will be reported.

Anharmonic Perturbative Methods for One-Dimensional Oscillators.

GRAYSON H. WALKER, The University of Tennessee at Chattanooga

A number of techniques have been proposed for solving the equations of motion of a conservative, one-dimensional oscillator. Almost all practical applications of these methods start with the solutions of the simple harmonic oscillator and obtain expressions for the period of the motion and for the coefficients of the Fourier series expansion of the perturbed motion in terms of the parameters of the unperturbed harmonic motion. Generally, these methods have a limited range of applicability.

In this report we present a direct method for using any member of a class of simple, anharmonic systems as the initial, unperturbed system. This method enables us to treat systems that are not amenable to the traditional approaches, particularly those involving extreme, anharmonic potentials. (Abstract provided but paper not presented at the meeting).

Cuprous Oxide Photocells.

M. M. GARLAND, Memphis State Univ. and R. S. SANTI, Harris Semiconductor.

Cu_2O photocells were constructed by the thermal oxidation of Cu plates in air. The photovoltaic response is shown to be strongly dependent upon surface treatment. The electrical characteristics of front surface cells with vacuum deposited gold contacts are treated theoretically using an MIS model. A good fit to the data is obtained by assuming semiconductor surface states which equilibrate with the semiconductor layer.

*Consequences of Low-Level Radioactive Waste Burial.**

D. E. FIELDS, C. A. LITTLE, C. J. EMERSON AND G. HIROMOTO, Oak Ridge National Laboratory

The PRESTO computer code has been developed for the Environmental Protection Agency to assist in the evaluation of possible health effects associated with shallow-land burial of low-level radionuclide wastes. Because of the flexibility of this model, it is expected that it will be extensively applied.

The authors have used the PRESTO code to simulate doses and health effects resulting from operations at the Barnwell, SC disposal site, and are preparing data bases to support evaluation of possible future health consequences from operations near Oak Ridge National Laboratory.

Results of simulations for the Barnwell, SC site are discussed.

Photoresponse Theory for Transition-Metal-Doped Semiconductor Electrodes.

DONALD R. FRANCESCHETTI AND LINDER METTS, Memphis State University and R. U. E. 't LAM, State University, Utrecht, Netherlands

Solar energy can be used to electrolyze water into hydrogen and oxygen in a photoelectrochemical cell with one metal and one semiconductor

electrode. Unfortunately, most semiconductors with the necessary chemical stability characteristics for this application have wide band gaps and thus absorb energy only in the ultraviolet part of the spectrum. To make more complete use of the solar spectrum, impurity levels near the middle of the band gap can be introduced by doping the semiconductors with transition metal ions. The dopant ions, however, have effects on minority carrier lifetime and transport properties which can greatly reduce the overall photoyield. A theoretical analysis of these effects and their role in determining quantum efficiency will be presented.

The Use of Glow Discharge Implantation in the Production of Solar Cells.

M. C. LU, Walters State Community College

It is now widely recognized that solar energy can be utilized to save or supplement the fuel consumption. The next problem has been centered around such question as how to reduce the cost of production and increase its technical feasibility. Thus, for the purpose of developing the low-cost and high-efficiency solar cells, some methods have been sought to fabricate polycrystalline and single crystal silicon cells. This paper is to present one of these techniques experimented in the laboratory with quite promising results. The procedure basically involves the implantation of ions from dopant source into the silicon surface by means of low voltage and high discharge current. A shallow p-n junction is then obtained. It has been found that the substrate heating of glow discharged silicon during laser annealing can significantly improve the electrical properties of the cell and thus increase its efficiency. (Abstract submitted but paper not presented at the meeting).

Non Linear AC Dynamics of Charge-Density-Wave Condensate in $NbSe_3$

G. X. TESSEMA, Department of Physics Memphis State University and N. P. ONG, University of Southern California Los Angeles, California

Phase space plots of the ac charge-density wave (CDW) current versus the ac voltage have been obtained in $NbSe_3$ for frequencies 0.1 - 5 MHz. The strong inductive hystersis observed is consistent with metastable states in the CDW and incompatible with the classical oscillator model. (Abstract submitted but paper not presented at the meeting).

Eddy Current Determination of Hydrogen Concentration in Pd.

R. C. LILES AND J. W. HANNEKEN, Memphis State University

This non-destructive method for determining hydrogen concentrations is based on the fact that the introduction of an electrical conductor into the field of a solenoid carrying an alternating current induces eddy currents in the conductor. These eddy currents reduce the magnetic flux, resulting in a change in both the resistive and the inductive components of the impedance. The magnitude of these effects depends on the resistivity of the conductor. The resistivity of the portion of the conductor in the field of the solenoid is determined by measuring the change of impedance of the solenoid with an ac impedance bridge. A small solenoid about 3 mm long was used as a probe to measure the resistivity along the length of a Pd hydride wire sample. The corresponding hydrogen concentration profile was then determined from the known dependence of resistivity versus hydrogen concentration for Pd.

Polarization and Conductivity in Tysonite-Type Materials.

PAUL C. SHIPE AND DONALD R. FRANCESCHETTI, Memphis State University

The classical theory of the bulk ionic conductivity of crystals with isolated point defects has been extended to include frequency-dependent bulk conductivity and polarization effects which arise in materials such as the tysonites, in which charge carrying defects can jump from one sublattice to another. The traditional treatment assumes a single jump probability for each charge carrying species; our extension allows for several different jump possibilities, each governed by a thermally activated jump probability. An equivalent linear electrical circuit is used to express the solution of the charge transport equation and is used in analyzing experimental data for both doped and undoped LaF_3. The results of our multiple jump analysis may be applicable to a number of other complex crystal structures.

Barrier Height as a Function of Surface Treatment in Cuprous Oxide Solar Cells.

I. W. PAYNE, Memphis State University

In efforts to better understand the nature of the barrier to charge flow at the copper/cuprous oxide interface and the sputter induced barrier at the surface of the cuprous oxide, surface treatment studies have been conducted on cuprous oxide solar cells at room temperature. From current and voltage measurements both the front barrier height and the back barrier height have been determined, as well as the series resistance.

Similar cells have been subjected to a chemical etch followed by a sputter etch (ion etch) which forms the surface barrier. Further studies of the ion etch show the dependence on the formation of the surface charge barrier as a function of sputter gas, potential, and time.

SCIENCE-MATH TEACHERS

DAVID ASHBY, *Presiding*

College Credit Courses In High School—Why and How.

JO HENDERSON, Oak Ridge High School

Many of our young people today are highly intelligent and well educated. By the end of the junior year in high school one may have more than enough credits for graduation and have taken all suitable courses in the curriculum of his/her school. However, most students at this stage lack social maturity to function optimally on a college campus or in any non-home environment. Therefore, alternative plans may be highly beneficial to the student and his family.

Two alternative plans are Advanced Placement courses and College Credit courses. How can we implement these courses making college credit while still in high school a reality? In the full paper, I will first discuss the generalities of implementing the two programs, then the specifics of each.

We have had both of these types of programs at Oak Ridge High School for several years. The enthusiastic acceptance of and response to them make the extra work, which is necessary, worthwhile.

Earthwatch—Research Opportunities.

L. C. CAIN, Webb School, Knoxville

Earthwatch is a nonprofit organization offering participants the opportunity to join world wide research expeditions. The speaker will tell of the Earthwatch organization and of her experiences with the expedition to the New Jersey Great Swamp Refuge. The Earthwatch program is most appropriate for teachers and students.

Behavior Approach to a Time-Management Problem.

P. H. LU, Walters State Community College

A person's success depends largely on his effective management of time in daily life. From the time of getting up in the morning to the time of going to bed at night, one needs to make a good plan and use so that life can be fulfilled optimally. Psychologists have used behavior modification techniques to shape life patterns including time management. The present paper is to report a study in the sleep-time management. An ABAB reversal design was used in a four-week period of experiment. After the behavior pattern (baseline) was established by recording in the first week, interventions were given in Phases 2 and 4, with a week of "leaving alone" in between. During the intervention, early sleeps were reinforced by a light snack and late sleeps were punished by a rubber-band snap. The results indicate that the sitting-up-late behavior can be modified through the self-monitoring contingency arrangements.

ZOOLOGY SECTION

MICHAEL L. KENNEDY, *Presiding*

Heterotardigrada of Northwestern Venezuela.

DIANE R. NELSON, East Tenn. State University and A. A. GRIGARICK AND R. O. SCHUSTER, University of California-Davis

No previous reports of Venezuelan tardigrades have been published. In June-July 1979 an entomological survey team from the University of California at Davis collected moss, liverwort, and lichen samples from several localities in northwestern Venezuela. The tardigrades were removed and specimens were slide-mounted in Hoyer's or critical point dried and sputter-coated for analysis with an ETEC scanning electron microscope at UC-Davis. Fourteen species of the Class Heterotardigrada were present in the samples: one species of *Oreella, Mopsechiniscus,* and *Bryodelphax;* two species of *Pseudechiniscus;* and nine species of *Echiniscus.* Of the 14 species, five are considered to be previously undescribed: one species of *Oreella* and *Bryodelphax* and three species of *Echiniscus* in the *arctomys* complex. Variability in taxonomic characters was analyzed with phase and scanning electron microscopy, and species/habitat/locality associations were examined.

Application of the Scanning Electron Microscope to Phalangid Systematics (Arachnida: Phalangida).

CHARLES R. MCGHEE MARION R. WELLS, Middle Tennessee State University

A preliminary study of the potential application of the scanning electron microscope to phalangid systematics is described. The SEM adds a new dimension of clarity and detail to characters considered to be of primary significance at the species level of taxonomy. Use of the SEM in revisions and descriptions of this Arachnid group is expected to result in a more precise evaluation and systematic interpretation.

Feeding Habits of *Squalorophrya macrostyla* and Life Cycle of Anarma brevis, Epizoic Suctoria (Protozoa) from Turtles.

AWAD N. BADDOUR AND RALPH E. SHARP, Middle Tennessee State University

Squalorophrya macrostyla is usually found on algae covered turtles and has been observed feeding on algal spores released by *Basicladia* sp. The hypothesis that *S. macrostyla* would survive on pure cultures of *Basicladia* sp. was tested. *S. macrostyla* survived up to 62 days on *Basicladia* sp. algal spores as the only food source while controls survived for three days.

Anarma brevis, an epizoic suctorian from turtles, was found to have two forms of external budding, two forms of internal budding, and conjugation in its life cycle. The larval forms from budding and conjugation were non-ciliated.

Observations on Horsehair Worms (Nematomorpha: Gordioidea: Chordodidae).

C. M. CHANDLER, M. R. WELLS, E. G. JONES, Middle Tennessee State University

Since October 1980, 26 horsehair worms (*Chordodes* sp.) have been collected at different times during summer and autumn from Carson Fork, a spring-fed stream in Cannon County, Tennessee. Adults ranged from 7 to 24 cm long, and both males and females lacked pronounced lobes posteriorly. Eggs were deposited in the laboratory and hatched to produce larvae. Some adults of both sexes were prepared for light and scanning electron microscopy. With light microscopy, all specimens show irregular, pigmented areas on the cuticle, areoles (papillae), and spines. Males have subterminal cloacal apertures and females, terminal apertures. Some specimens have numerous diatoms, *Cocconeis,* scattered over the cuticle. Scanning electron microscopy (with ISI, SX-30) on adults revealed details of cuticular structures and patterns: papillae (areoles) clumped but not in a regular pattern, some papillae with several apical bristles and others with a single elongated bristle, and spines within and lateral to the cloacal opening of males.

Metabolism of p,p'-DDT By the Freshwater Planarian, *Phagocata Gracilis*

MARION R. WELLS AND EVARIST ANAYO ONWUMERE, Middle Tennessee State University

The metabolism of p,p'-DDT was investigated in the freshwater planarian, *Phagocata gracilis,* following a feeding period using beef liver perfused with 10 ppm of p,p'-DDT in corn oil. Insecticides were extracted by using hexane and acetonitrile, and florisil was used for cleanup. Analysis of p,p'-DDT and its metabolites was accomplished through the use of electron-capture gas chromatography. The results indicated that *P.* gracilis converted p,p'-DDT into at least two metabolites: p,p'-DDD and p,p'-DDE. There was no mortality in any planarians used in this study from p,p'-DDT or its metabolites. Reductive dechlorination of p,p'-DDT to p,p'-DDD was the major metabolite.

Intraspecific Variability in Cranial and Postcranial Features of Blarina brevicauda.

G. D. BAUMGARDNER, J. MCPHERSON, AND M. L. KENNEDY, Memphis State University

Age, individual, and sexual variation was statistically assessed for a maximum of 11 cranial and 11 postcranial characters in a sample of 84 short-tailed shrews (*Blarina brevicauda*). No distinct trend for size variation with age was evident for cranial characters while postcranial features exhibited a moderate trend for size increase with age. Of the statistically significant age variation observed (3 cranial, 8 postcranial instances), young adults and adults formed the largest nonsignificant age subset. Individual variation in cranial characters was low and similar to other studies. Postcranial character individual variation was slightly higher but still acceptable. Tests of sexual variation showed that males tended to be larger than females but only one cranial and three postcranial characters exhibited statistically significant differences. As evidenced by relatively low to moderate levels of age, individual, and sexual variation, the postcranial characters examined appear to be adequate for use in morphometric studies.

Genetic Variation in River Otter from Western Tennessee.

MEREDITH J. HAMILTON AND PHYLLIS K. KENNEDY, Memphis State University

Liver and kidney samples of the river otter *Lutra canadensis* (4 female and 12 male) from western Tennessee were elctrophoresed by the starch gel method. Of 16 protein systems examined, 14 were scorable; 20 structural loci (presumptive) encoded the scorable systems. Only esterase and isocitrate dehydrogenase exhibited any variation.

Genetic Variation in White-Tailed Deer from Tennessee.

PHYLLIS K. KENNEDY AND MICHAEL L. KENNEDY, Memphis State University

Significant interlocality genetic differences were observed for 465 white-tailed deer collected during the 1981-82 hunting season. Liver and kidney samples were subjected to starch gel electrophoresis, and 16 protein systems encoded by 24 structural loci (presumptive) were examined. Of the consistently scorable loci, 11 were polymorphic (of which five were only slightly polymorphic). Average individual heterozygosity ranged from 0.1689 to 0.2909 when calculated for 11 loci. Interlocality differences were assessed with Wright's F-statistics, Rogers' genetic similarity coefficient, Nei's genetic identity coefficient, and contingency table statistics.

Home Range and Denning Sites of a Gray Fox (*Urocyon Cinereoargenteus*) in Western Tennessee.

FARROKH R. TABATABAI, Memphis State University

Home range and denning sites of a young male gray fox (*Urocyon cinereoargenteus*) was studied on Shelby Forest Wildlife Management Area and Meeman Biological Field Station in Shelby County, Tennessee. Using radio telemetry techniques, the animal was followed from May through July 1981. With 63 radio fixes in 27 days, home range size was estimated to be 124.3 ha. Ten different den sites were located in dense under cover, within forested areas, or in openings at the forest edge heavily covered with honeysuckle (*Lonicera* spp.).

Ecological Studies of the Raccoon (*Procyon lotor*).

RICHARD A. SMITH, Memphis State University

The sex ratio, litter size, parasites and food habits of a population of raccoons (*Procyon lotor*) were studied from December 1980 through November 1981. The study area was the Land Between The Lakes in Stewart Co., Tennessee and Lyon and Trigg counties in Kentucky. One hundred and forty-five specimens were examined. The population was 49.7 percent male and 51.3 percent female. Average litter size was determined to be 2.9. Intestinal parasites and percent occurrence were: Acanthocephalans (48.0), Nematodes (88.0), and Cestodes (22.0). The filarial worm, *Dipetalonema procyonis,* was located around the ankles of 14.0 percent of the raccoons. Of the diaphragms examined, one third (35) were infected with *Trichinella spiralis.* The four most common food items and percent occurrence were: insects (82.0), corn (25.0), persimmon (21.0), and crayfish (17.0).

Anomalies of Three Areas of the Arterial System of Felis Domestica.

J.O. BARRETT AND J.G. PARCHMENT, Middle Tennessee State University

The purpose of this study was to describe the normal anatomy and the anomalies observed in a random group of cats and to determine possible causes of arterial anomalies.

One hundred specimens of *Felis domestica* were dissected in the laboratory. The branching patterns of the arch of the aorta, renal arteries and iliac arteries were observed and recorded. The branching patterns characterizing the majority of the animals was considered the normal pattern. The patterns which were rare and significantly different from the normal pattern were considered anomalies. These patterns are described in detail in this study.

The results of this study lead to the conclusion that arterial anomalies occur rather commonly in the cat and are associated with body build and heredity.

Effects of Marking Techniques on Growth and Survival of Channel Catfish Fingerlings.

J. LARRY WILSON AND CANEY P. KNAUTH, The University of Tennessee, Knoxville

Three groups of fingerlings channel catfish were marked using either a partial fin clip of the left pelvic fin, a cold-brand using liquid nitrogen, or a gun-injected Floy tag. Fish were compared to a control group for loss of marks, noticeable change in behavior, mortality attributed to the marks, and significant effects on growth.

The cold brand was the only mark that was still retained by the fish and recognizable after a 12-week period. Behavior was greatly altered only in the group receiving the injected tag; this group also exhibited the only substantial rate of mortality attributed to the mark. Statistical analysis of the effects of the three marking techniques on growth indicated that the application of the marks had no significant effect on those fish surviving throughout the experimental period.

The Literature of Middle Tennessee Herpetology.

A. FLOYD SCOTT, Austin Peay State University

Since 1838, when the first mention of any herptile in Middle Tennessee appeared in the literature, over 200 publications including books, scientific and popular journal articles, and technical reports have come out relating to the subject. All but 13 (6%) of these were printed after 1920 and 146 (74%) came after 1950. The major portion (64%) of this literature is national or regional in scope and is part of a body of information that has expanded progressively through the last three decades. The rest, which deals specifically with herptiles throughout the mid-state or some local area within, peaked during the 1950s and has dropped off continally ever since. This suggests a declining interest in the herps of Middle Tennessee despite the fact that much more information is needed before even the basic questions concerning the taxonomy and distribution of many forms can be answered.

Migration Patterns of Wood Warblers During the Fall in Southwestern Tennessee.

MARK E. RITKE, Memphis State University

Populations of migrating wood warblers (Parulidae) were studied during