

Frank E. Dodson
Biology Dept.
Dyersburg St. Comm. College
Dyersburg, TN. 38024

Dr. Sherwood F. Ebey
Dept. of Mathematics
University of the South
Sewanee, TN. 37375

Karen D. Fink
Box 103 Lee College
Cleveland, TN. 373-1

Thomas H. Florence
615 West Street
Murfreesboro, TN. 37130

Ron J. Garavelli
3493 Tchulahoma
Memphis, TN. 38118

Dr. Arthur M. Geller
Dept. Biochemistry
UT Center for Health Sci.
Memphis, TN. 38163

Robert Lynn Green
Dept. Biology TTU
Cookeville, TN. 38501

Ronald L. Harris
Lee College
Cleveland, TN. 37311

Mark Allen Herndon
Route 1
Harrison, TN. 37341

Jeffrey L. Hoyer
Box 6384 MTSU
Murfreesboro, TN. 37130

Phillip L. Huddleston
Box 1203 MTSU
Murfreesboro, TN. 37130

Dr. James J. Johnson
Math & Comp. Sci. Dept.
UTM
Martin, TN. 38238

Robert L. King
2222 Garnet Road
Millington, TN. 38053

Harold W. Kolni
775 N. Willett
Memphis, TN. 38107

Dr. N. K. Lakshmanan
Director Institute Environ.
Studies
Lemoyne-Owen College
807 Walker Avenue
Memphis, TN. 38126

Thomas H. Lawrence, III
4179 Hilldale
Memphis, TN. 38117

Charles William Lewis
Box 4449 MTSU
Murfreesboro, TN. 37130

Dr. Carol J. Marcus
Dept. Biochemistry
UT Center for Health Sci.
Memphis, TN. 38163

Dr. Franklin C. Mason
Box 526 MTSU
Murfreesboro, TN. 37130

Raymond C. Mathews, Jr.
Biology Dept. TTU
Cookeville, TN. 38501

Jan Earl Medlin
3687 Royalwood Drive
Memphis, TN. 38128

Dr. Eric L. Morgan
Box 5187 Biology Dept. TTU
Cookeville, TN. 38501

John A. Ndon
Box 63285
UT Center for Health Sci.
Memphis, TN. 38163

Dr. Ralph B. Paisley
Dept. Biology
Bryan College
Dayton, TN. 37321

Brenda J. Payne
Box 5652 TTU
Cookeville, TN. 38501

Edward S. Penick
370 East 16th Street
Cookeville, TN. 38501

Milton W. Riley
Box 922 Lee College
Cleveland, TN. 37311

Debra L. Schoenrock
USGS WRD
144 Federal Office Building
Nashville, TN. 37203

John C. Shadwick
Apt. 18, 802 E. Main Street
Murfreesboro, TN. 37130

Carroll E. Slack
UTM
Martin, TN. 38238

Joseph E. Snow
Route 1 Box 146
Buchanan, TN. 38222

Donald C. Speight
1315 East Castle Street
Apt. A3
Murfreesboro, TN. 37130

Howard H. Vogel, Jr.
Dept. of Radiation Oncology
UT Center for Health Sci.
Chandler Bldg. G128C
Memphis, TN. 38163

Dr. Joseph D. Wander
324 B Bowld Hospital
951 Court
Memphis, TN. 38163

Dr. Charles O. Warren
Southwestern at Memphis
2000 N. Parkway
Memphis, TN. 38112

Dr. Harris O. Yates
Meadow Lake Road, Route 2
Brentwood, TN. 37202

JOURNAL OF THE TENNESSEE ACADEMY OF SCIENCE
VOLUME 50, NUMBER 2, APRIL, 1975

**ABSTRACTS PRESENTED AT THE ANNUAL MEETING
NOVEMBER 22 AND 23, 1974, UNIVERSITY OF TENNESSEE
CENTER FOR THE HEALTH SCIENCES**

GENERAL SESSION

Robert L. Amy, Chairman

A New Science Education Resource in Tennessee. John F. Yegge, Oak Ridge Associated University (30 min.)

This Land is Open—Recreational and Research Opportunities on Industrial Forestland. Joel G. Zachry, Roane State Community College (30 min.)

Computer Simulation of Mass Transport on Walker Branch Watershed, Oak Ridge, Tennessee. Part I: Water and Sediment Transport. David E. Fields and Richard J. Raridon, Union Carbide Corporation Nuclear Division (15 min.)

Computer Simulation of Mass Transport on Walker Branch Watershed, Oak Ridge, Tennessee. Part II: Trace Element Transport. Richard J. Raridon and David E. Fields, Union Carbide Corporation Nuclear Division (15 min.)

A New Science Education Resource in Tennessee. John F. Yegge, Oak Ridge Associated Universities.

The new Science Education Resource Center (SERC), will serve science education in its region from a base in the new American Museum of Atomic Energy. Now in the final stages of construction, the museum will open its doors to the public and the educational community on February 17, 1975.

The SERC will serve the educational community in several ways: there will be a display of science education materials for examination by area teachers; there will be in-service and pre-service teacher education programs; there will be a computer assisted instruction facility; there will be special educational activities for visiting school groups; there will be a newsletter for teachers in the area; there will be a program for mailing to teachers special kits of teaching materials. These and other science education services will be available through SERC. The TAS members should be aware of these activities so they can be a source of information as a service to their local educational communities.

This Land is Open—Recreational and Research Opportunities on Industrial Forestlands. Joel G. Zachry, Roane State Community College.

If our environment is to maintain a quality necessary to sup-

port life and man is to progress economically, a compromise between his demands and the requirements of industry must be met. Bowaters Paper Corporation, operating plants in the United States and Canada is the largest producer of newsprint paper, representing an important contribution to the world's economy, yet remaining consciously aware of its environmental responsibilities.

Aside from meeting Environmental Protection Agency requirements through the management of sophisticated laboratories with trained personnel, Bowaters makes thousands of acres of its forestlands open to the general public. Hunting permits are issued annually and also free firewood agreements are signed.

Among the most impressive contributions afforded by Bowaters are the three pocket wildernesses located in Tennessee—Honey Creek, Lauri-Snow Falls and Virgin Falls. All are national, state recreational trails and state registered natural areas, offering untold educational and scenic opportunities to the public.

Computer Simulation of Mass Transport on Walker Branch Watershed, Oak Ridge, Tennessee. Part I. Water and Sediment Transport. David E. Fields and Richard J. Raridon, Union Carbide Corporation Nuclear Division.

A Unified Transport Model (UTM) which simulates trace element transport through the atmospheric, land, and channel ecosystems on a watershed scale is operational and undergoing continued development. The UTM, portions of which are derived from the Stanford Watershed Model, is a mechanistic approach and incorporates algorithms detailing chemical exchange between the sediment and water phases at the land surface and in the channel system itself. Sediment transport is simulated in the channel system via the CHNSED submodel. The UTM is being validated on several field sites, among these Walker Branch Watershed at the Oak Ridge National Laboratory where simulations of hydrologic response over the period October 1969 through December 1973 yield good agreement between observed and simulated monthly runoff values.

Computer Simulation of Mass Transport on Walker Branch Watershed, Oak Ridge, Tennessee. Part II. Trace Element Transport. Richard J. Raridon and David E. Fields, Union Carbide Corporation Nuclear Division.

The Unified Transport Model has been used to simulate the movement of potassium and cadmium through the Walker Branch Watershed, a highly instrumented area of 250 acres situated near the Oak Ridge National Laboratory. Weekly measurements of trace materials is rainfall and dustfall, together with hourly rainfall data, provided the input for the computer program. The calculated amounts of potassium and cadmium in the stream exiting the watershed show reasonable agreement with the observed values. Some potassium appears to be leached from the soil since the output on an annual basis, ca. 5 kg per hectare, is approximately twice the input. In contrast, preliminary observations indicate that over 90% of the input of cadmium is retained by the watershed.

BOTANY SECTION

Ageing Studies on Isolated Cinnamon Fern Leaves. James D. Caponetti University of Tennessee at Knoxville (15 min.)

Phylogeny and Equal Weighting in Numerical Taxonomy. Richard Jensen and W. Hardy Eshbaugh, Miami University, Oxford, Ohio (15 min.)

Biological Effect of Selected Pesticides on Barley Seeds. Prem S. Kahlon, Tennessee State University (10 min.)

Methylation of Lettuce Seedling RNA. B. P. Stone, Austin Peay State University (12 min.)

The Effect of Gamma-Irradiation on Lettuce Seed Physiology. Lynn P. Yealy and B. P. Stone, Austin Peay State University (15 min.)

Initial Cell Division of Sensitive Fern (Onoclea sensibilis L.) Spores and the Effects of Carbon Dioxide. Maurice E. Edwards, University of Tennessee at Chattanooga (15 min.)

Periphyton Studies of the Cumberland River and Dixon Creek, 1974. Wendell L. Pennington and Hollings Andrews, Tennessee Cooperative Fishery Unit, Tennessee Technological University (15 min.)

Ageing Studies on Isolated Cinnamon Fern Leaves. James D. Caponetti, University of Tennessee.

Since cinnamon fern leaf primordia are amenable to sterile culture, they offer a workable system for the study of development and ageing in detached leaves. Ageing studies have been conducted on detached angiosperm leaves which yellow and die quickly a few days after detachment. Cinnamon fern offers a system wherein excised leaf primordia may be placed in sterile culture under defined and controlled conditions. Cellular components may be monitored during a 10-week period of growth and development to maturity, and then ageing of the mature leaf during the next 10 weeks. The monitoring of total chlorophyll, total protein, and total amino acid showed that the chlorophyll and protein content steadily increased during growth of the primordia to maturity, and then decreased during ageing. Chlorophyll and protein breakdown were delayed in leaves cultured on kinetin supplemented medium. Amino acid content remained rather stable during growth and ageing of the leaves, and kinetin appeared not to alter the content of amino acids.

Phylogeny and Equal Weighting in Numerical Taxonomy. Richard Jensen and W. Hardy Eshbaugh, Miami University.

Standard numerical taxonomic procedures rely on the use of numerous equally weighted characters to produce classifications of the organisms involved. The resulting phenograms have often been interpreted as reflecting the phylogenetic relationships of these organisms. The authors present examples from two genera (*Capsicum* and *Quercus*) which contradict the presumed and/or known phylogenies of the groups in question. These results emphasize the fact that phenograms produced by equally weighted characters should not be relied upon as accurate indicators of the phylogenies of the included organisms.

Biological Effect of Selected Pesticides on Barley Seeds. Prem S. Kahlon, Tennessee State University.

Seeds (caryopses) of barley, *Hordeum vulgare*, Cv. Trent were exposed to various concentrations of pesticide suspensions. The pesticides used were Telvar containing 80% Monuron (3-p-Chlorophenyl 1-1-dimethylurea), Phosdrin containing dimethyl phosphate of methyl 3-hydroxy-crotonate, Chlorothalonil containing Tetrachloroisophthalonitrile, and Amitrol containing 3-Aminotriazole. Seedling injury (reduction in seedling height of 5 day old plants) and chromosome aberrations from the shoot tip cells were studied. Pesticides tested vary considerably with respect to seedling injury and chromosome damage. Seedling injury caused by the pesticides appears primarily to be due to physiological causes. Chromosome aberrations seem to have added to the physiological damage.

Methylation of Lettuce Seedling RNA. B. P. Stone, Austin Peay State University.

The physiology of Lettuce Seed germination and Seedling growth will be discussed in relation to methylation of ribosomal and transfer RNA.

The Effect of Gamma-Irradiation of Lettuce Seed Physiology. Lynn P. Yealy & B. P. Stone, Austin Peay State University.

The effect of gamma-irradiation on germination and hypocotyl elongation of Grand Rapids lettuce seeds will be discussed in relation to the interactions of gibberellic acid and 5-fluorouracil. Data will be presented to substantiate that ionizing radiation delays germination of Grand Rapids lettuce seeds through an inhibition of ribosomal RNA synthesis.

Initial Cell Division of Sensitive Fern (Onoclea sensibilis L.) Spores and the Effects of Carbon Dioxide. Maurice E. Edwards, University of Tennessee at Chattanooga.

The effects of gaseous atmospheres of carbon dioxide (CO₂) on the initial cell division (germination) of fern spores are being studied. Unicellular spores of *Onoclea sensibilis* L. are cultured aseptically on 10 ml of Knop's solution, pH adjusted to 5.0, in 2-liter dry-sealing desiccators, and in an environmental growth chamber of ca. 300 ft-c cool white fluorescent light at 25° C. Germination is scored 48 hours following sowing of spores. In CO₂ atmospheres between 0-ca. 3% (v/v), spores exhibit normal germination percentages of ca. 95%. Carbon dioxide concentrations greater than ca. 3% are inhibitory, and no germination occurs in 20-25% CO₂. No change in the pH of culture media is detectable. The inhibition of germination by CO₂ is reversible. Carbon dioxide is not considered to be a general inhibitor of growth.

Periphyton Studies of the Cumberland River and Dixon Creek, 1974. Wendell Pennington and Hollings Andrews, Tennessee Technological University.

Periphyton was analyzed from February through October, as part of a preconstruction limnological study of the Cumberland River near the proposed site of the Hartsville Nuclear Power Plant. The results of this study will be used for comparative purposes during the constructional and operational phases of the plant to determine the effects of thermal discharge upon the periphyton. Periphyton samplers were placed in the river at five locations and recovered every 14-17 days. Species identification, numbers per unit area, organic weight and chlorophyll a concentrations were determined in the laboratory. Chrysophyta dominated the periphyton during this period and Chlorophyta showed marked increases and decreases. An Autotroph-Heterotroph Index was also determined and ranged from .31 to 66 with a mean value of about 20. Results of this survey indicate that the periphyton communities of the Cumberland River were not subject to severe stress during this period of study.

CHEMISTRY SECTION I

Frank A. Momany, Chairman

An Evaluation of the Keller Plan in a Chemistry course for Allied Health Science students. John E. Baxter and Larry L. Lambert, The University of Tennessee Center for the Health Sciences (20 min.)

Boron 11 NMR Chemical Shift Assignments. R. F. Sprecher and B. E. Aufderheide, Memphis State University (20 min.)

An Improved Intermolecular Force Field for Vapor Phase Dimers and Crystalline State Carboxylic Acids. F. A. Momany, Memphis State University (20 min.)

Ion Counting Techniques in Mass Spectrometry. W. Wysochansky and J. C. Williams, Memphis State University (20 min.)

Use of a Microwave Oven to Dry Chemical Samples. Roy S. Clark and Wm. C. Stroud, Middle Tennessee State University, Murfreesboro (20 min.)

The Microwave Spectra and Dipole Moment of the Cyanopyridines. R. Ford, Memphis State University (20 min.)

Tertiary Phosphine and Phosphite Derivatives of N, N-Diisopropyl-Hydrazine and N, N-Methylphenyl-hydrazine. Douglas W. McKennon and Larry W. Houk, Memphis State University (20 min.)

Group VIB Metal Carbonyl Complexes of Selected Phosphine and Phosphite Hydrazines. Guy E. Graves and Larry W. Houk, Memphis State University (20 min.)

An Evaluation of the Keller Plan in a Chemistry Course for Allied Health Science Students. John E. Baxter and Larry L. Lambert, University of Tennessee.

A controlled study has been done to evaluate the effectiveness of the Personalized Instruction (PSI or Keller Plan) approach in presenting inorganic and organic background material for elementary biochemistry course. Eleven of thirty four class members were randomly assigned to receive materials by the PSI self-study technique. The remainder of the class were instructed by a conventional lecture approach. While a pretest indicated no difference between the two groups, members of the PSI group scored significantly better on a common exam given at the conclusion of the trial period.

Boron 11 NMR Chemical Shift Assignments. R. F. Sprecher and B. E. Aufderheide, Memphis State University.

All of the twelve possible monochloro, monobromo and moniododecaborane(14) isomers were prepared and purified using preparative thin layer chromatography. The properties of 5-chlorodecaborane(14) and 6-iododecaborane(14) had not been previously reported. Boron-11 nuclear magnetic resonance chemical shift assignments were determined for all the isomers using the ¹¹B-¹³B double resonance technique. The shift changes of the substituted borons were found to correlate well with halogen electronegativity and the expected changes in the r⁻⁸ and paramagnetic shift terms, produced by changes in boron 2p orbital charge density. The shift trends of the non-substituted borons are those expected to result from changes in boron 2p orbital size as a result of donation of electron density from the halogen non-bonded orbitals to the electron deficient decaborane (14) cage. Shifts were also determined for seven dihalodecaboranes; 2,4-diiododecaborane(14); 1,2-diiododecaborane(14); 1-chloro-6-bromodecaborane(14) and 2-chloro-6-bromodecaborane (14). The change in chemical shift of the dihalodecaborane was found to be the additive contribution of the shift change from both halogens considered separately, enabling accurate prediction of shifts for other dihalodecaboranes.

Chemical shifts were also determined for the B₁, B₂ and B₃ substituted, monochloro, monobromo and moniodo-6,6-bis-dimethylsulfide decaboranes. This series displayed the same shift trends as the halodecaboranes, only in a more regular manner. Experimental data indicated a partial loss of ¹¹B-¹³B and ¹¹B-¹H coupling which was attributed to a faster quadrupole relaxation, and a shorter T₁. A correlation was also observed between ligand basicity and the average ¹¹B chemical shift.

An Improved Intermolecular Force Field for Vapor Phase Dimers and Crystalline State Carboxylic Acids. F. A. Momany, Memphis State University.

An empirical intermolecular potential energy function for carboxylic acids has been derived using data from pertinent available experimental and theoretical studies. The data utilized includes the gas-phase electron diffraction structures of dimers of acetic and formic acids, intermolecular vibrational frequencies of these same dimers, gas-phase dipole moments, X-ray structures of crystalline carboxylic acids, thermodynamic data, and partial atom charges and charge variation upon hydrogen-bond formation obtained from molecular orbital studies. The resulting potential reproduces all available experimental data exceptionally well.

Ion Counting Techniques in Mass Spectrometry. W. Wysochansky and J. C. Williams, Memphis State University.

An ion counting mass spectrometer system has been developed for routine use in an analytical laboratory. It is a computer based system with provisions for on-line data acquisition and treatment. The system is capable of handling one spectrum every 18 seconds, covering a mass range of 28 to approximately 1000 m/e units.

The ion counting system has been shown to be comparable with analog detection methods in precision, accuracy, and flexibility of measurements. Through the use of pulse discrimination the dynamic range of peak intensities has proven to be approximately 20,000 to 1 for the digital mode.

The ion counting system has proven to be less susceptible than the analog system to the inherent mass discrimination effects of an electron multiplier. Thus, the pulse counting system yields a more accurate picture of the ion flux at high masses.

Use of a Microwave Oven to Dry Chemical Samples. Roy W. Clark and Wm. C. Stroud, Middle Tennessee State University.

A microwave oven operating at 2450 Mhz. and a power of 650 watts was constructed and used to dry chemical samples normally dried thermally. Microwaves were also used to dry glassware after cleaning. The efficiency of a microwave oven versus a thermal convection oven was investigated and the results are presented. The peculiar advantage of microwave drying are discussed.

The Microwave Spectra and Dipole Moment of the Cyanopyridines. R. G. Ford, Memphis State University.

The microwave spectra of 2-cyanopyridine, 3-cyanopyridine and 4-cyanopyridine have been observed and assigned. It appears that substitution of a cyano group on the pyridine ring causes the carbon atom to which the cyano group is attached, to move slightly closer to the center of the ring. This effect has previously been noted for benzene rings when either fluorine or a cyano group is substituted.

The dipole moments of the three compounds have also been measured and are: 2-cyanopyridine 5.77D, 3-cyanopyridine 3.72D, and 4-cyanopyridine 1.96D.

Phosphite Derivatives of Hydrazine and Selected Alkyl and Aryl Hydrazines. Douglas W. McKennon and Larry W. Houk, Memphis State University.

A series of phosphitohydrazines have been synthesized by allowing chlorodithiophosphite to react with hydrazine and selected alkyl and aryl substituted hydrazines. The following derivatives have been prepared: N,N-methylphenyl-N'-diethylphosphitohydrazine, $(CH_3)_2P(OC_2H_5)_2N(CH_2)_2NH(CH_2)_2NH(CH_2)_2$; N-methyl-N,N'-bis(diethylphosphito)hydrazine, $(CH_3)_2P(OC_2H_5)_2N(CH_2)_2N(CH_2)_2P(OC_2H_5)_2$; N,N'-bis(diethylphosphito)hydrazine, $(H)_2P(OC_2H_5)_2N(CH_2)_2N(CH_2)_2P(OC_2H_5)_2$; and N,N'-dimethyl-N,N'-bis(diethylphosphito)hydrazine, $(CH_3)_2P(OC_2H_5)_2N(CH_2)_2P(OC_2H_5)_2$. Structures were elucidated primarily from an analysis of proton and phosphorus nuclear magnetic resonance data.

Group VIB Metal Carbonyl Complexes of Selected Phosphine and Phosphite Hydrazines. Guy E. Graves and Larry W. Houk, Memphis State University.

Metal carbonyl complexes of chromium, molybdenum, and tungsten have been prepared with the phosphine and phosphite hydrazines, $RR'_2N-N(CH_2)_2$ where $R = P(C_6H_5)_2$, $R' = H$; $R = P(C_6H_5)_2$, $R' = PR = P(OC_2H_5)_2$, $R' = H$; $R = R' = P(C_6H_5)_2$, $R' = P(OC_2H_5)_2$; and $R(CH_3)_2N-N(CH_2)_2$ where $R = P(C_6H_5)_2$ and $R = P(OC_2H_5)_2$. The compounds were characterized by infrared spectroscopy, proton and phosphorus NMR, elemental analysis and molecular weight determinations. The ligands have been found to bond preferentially to the transition metal through the phosphorus atom rather than through the nitrogen atoms.

BIOCHEMISTRY SECTION II

Jurbram M. Wakim, Chairman

Prosthetic Group Exchange in Synchronized Cultures of E. Coli. J. DeLoach and A. R. Larrabee, Memphis State University (15 min.)

Synthesis of Subunits of Rat Liver Fatty Acid Syn-

thetase. L. Strawser and A. R. Larrabee, Memphis State University (15 min.)

Lecithin/Spingomyelin Assay in the Assessment of Fetal Lung Development. W. D. Whybrew, J. C. Morrison, W. L. Wiser, S. A. Fish, S. W. Arnold, G. Ellis, and E. T. Bucovaz, University of Tennessee Center for the Health Sciences (15 min.)

Alteration of Cysteamine-Protein Complete, Through Reaction with Cyclic Hydrocarbons. T. D. Smith, W. C. Morrison, C. M. Sobhy, W. D. Whybrew, W. L. Wiser, S. A. Fish and E. T. Bucovaz, University of Tennessee Center for the Health Sciences (15 min.)

Some Functions of ATP Associated with the Formation of the Cysteamine-Protein Complex. C. M. Sobhy, T. D. Smith, J. C. Morrison, W. D. Whybrew, W. C. Morrison, W. L. Wiser, S. A. Fish and E. T. Bucovaz, University of Tennessee Center for the Health Sciences (15 min.)

Protection of α -Amylase by Group II A Elements Against Inactivation by Urea. J. M. Wakim, Robert Thornberg, and Hugh McClanahan, University of Tennessee at Martin (15 min.)

Studies on Sterol Metabolism by Mixed Function Oxidase of Rat Liver Microsomes. R. Crowder and D. Brady, Memphis State University (15 min.)

Variant Residues and Rates of Protein Evolution. T. Chirpich, Memphis State University (15 min.)

Mercapto Group and Enzymatic Activity Relationships of 3 α -Hydroxysteroid Dehydrogenase and Other Similar Enzymes. Johnnie Roberts and S. K. Airee, University of Tennessee at Martin (15 min.)

Acetyl Cholinesterase and Excitable Membranes. J. E. Bulger, Memphis State University (15 min.)

Calcium Binding to Excitable Membranes. A. S. Hitt and J. E. Bulger, Memphis State University (15 min.)

Prosthetic Group Exchange in Synchronized Cultures of E. coli. J. DeLoach and A. R. Larrabee, Memphis State University.

Fatty acids are synthesized *de novo* in *E. coli* as thioester derivatives of a small protein named acyl carrier protein (ACP). Acyl groups from thioesters with 4'-phosphopantetheine, the covalently bound prosthetic group of ACP. The laboratory of Vagelos showed that the 4'-phosphopantetheine group is rapidly cleaved from ACP in growing cultures of *E. coli* and replaced via CoA at the rate of 4% of the ACP pool per minute in a culture with a doubling time of 70 min. The present studies were designed to study this prosthetic group exchange as a function of the stage of cellular growth. Division synchronized cultures of *E. coli* were pulsed with labeled pantoic acid at various times and ACP was purified from samples collected after 10 minutes exposure to label. It was found that prosthetic group exchange occurs at a fixed rate throughout the life cell of the cell.

Synthesis of Subunits of Rat Liver Fatty Acid Synthetase. L. Strawser and A. R. Larrabee, Memphis State University.

Rat liver fatty acid synthetase is a multienzyme complex of at least five enzymatic activities and acyl carrier protein. The number of polypeptide subunits composing the complex is not known. Previous studies have shown that the various subunits of the complex have different turnover times and thus the turnover mechanism was postulated to act on free pools of

subunits rather than act on an intact complex. The present studies measured the rate of appearance of labeled amino acids in the various subunits of FAS. The results obtained suggest that: (1) subunit pools exchange with intact FAS at a slow rate requiring several hours to equilibrate label between a subunit and intact FAS, (2) the exchange rate of each subunit may be inversely related to the size of the subunit. These observations lend additional support for the free pool turnover model mentioned above.

Lecithin/Spingomyelin Assay in the Assessment of Fetal Lung Development. W. D. Whybrew, J. C. Morrilstown, W. L. Wiser, S. A. Fish, S. W. Arnold, G. Ellis and E. T. Bucovaz, University of Tennessee

Measurement of the lecithin/spingomyelin ratio in the amniotic fluid has been shown to be a valuable criteria for the assessment of fetal lung maturity. This method, however, is sensitive to changes in humidity and requires a number of extraction steps. In our laboratory we have developed a modification of the procedure that does not require elaborate equipment for humidity control and has fewer extraction steps. The content of lecithin and sphingomyelin was determined by the extraction of these materials from the amniotic fluid followed by chromatography of the extract on silica gel G thin layer plates using chloroform-methanol-water (65:25:3) as the developing solution. After development, the plates were sprayed with 50% sulfuric acid and heated at 250° to detect lecithin and sphingomyelin. Heat activation of the thin layer plates following sample application prevents moisture content of the atmosphere from affecting the pattern of separation of phospholipids. The method as modified has been shown to be 99% accurate in the assessment of the fetal maturity in more than 300 cases. Because the fetal lung is involved in hyaline membrane disease, which accounts for the majority of neonatal deaths, it is advantageous to have a simple and accurate method of detecting the maturity of the fetal respiratory system prior to delivery.

Alteration of Cysteamine-Protein Complex through Reaction with Cyclic Hydrocarbons. T. D. Smith, W. C. Morrison, J. C. Morrison, C. M. Sobhy, W. D. Whybrew, W. L. Wiser, S. A. Fish and E. T. Bucovaz, University of Tennessee

Previously we have reported the presence of a protein complex in the 105,000 x g supernatant fraction of human endometrium, rat liver and Bakers' yeast that reacts with L-cysteine. The reaction is between an acceptor site on the protein complex and the α -amino group of cysteine. The cysteine moiety is decarboxylated in the process of binding, which results in cysteamine being attached to the protein complex. In turn the 1,2-epoxide of 1,2,3,4-tetrahydronaphthalene (epoxy-THN) has been shown to conjugate with the SH-group of the cysteamine moiety of the protein complex. On the other hand, THN-cysteine will not replace cysteine in the reaction with the protein complex. In subsequent studies we have observed that the cysteamine-protein complex appears to form a lower molecular weight cysteamine-protein subunit. Conjugation of epoxy-THN with the cysteamine protein complex interferes with the formation of this subunit. Studies show that the binding of other activated cyclic hydrocarbons produce similar results. The data were obtained by gel filtration and by measuring the radioactivity in the hot trichloroacetic acid precipitate. Conjugation of an activated cyclic hydrocarbon with the cysteamine moiety of the protein complex appears to alter the protein complex and possibly change the hydrocarbon, or both. Once the role of the protein complex in cellular metabolism is understood, an assessment may be possible in explaining the role this reaction has in relationship to the mechanism of carcinogenesis by hydrocarbons.

Some Functions of ATP Associated with the Formation of the Cysteamine-Protein Complex. C. M. Sobhy, T. D. Smith, J. C. Morrison, W. D. Whybrew, W. C. Morrison, W. L. Wiser, S. A. Fish and E. T. Bucovaz, University of Tennessee.

In previous reports we described a heat labile protein complex present in the 105,000 x g supernatant fraction of human endometrium, rat liver and Bakers' yeast which binds L-cysteine.

Required components for the *in vitro* binding are cysteine, ATP, Mg^{++} and the protein complex. At the time of reaction or immediately thereafter cysteine is decarboxylated resulting in cysteamine bound through its amino group to an acceptor site on the protein complex. Subsequent studies have revealed that during the course of cysteine binding, ATP is converted to ADP through the hydrolysis of its γ -phosphorus presumably providing energy for cysteine binding. The ADP was also shown to be bound to the protein complex. Catalytic activity for the binding of ADP was determined by measuring the radioactivity of the hot trichloroacetic acid precipitate. The ADP was shown to bind in a concentration proportional to that of cysteine. Whether ADP and cysteamine are bound to separate sites on the protein complex or whether an ADP-cysteamine reaction product is formed has not been determined. Nevertheless, this finding has added to our knowledge of the reaction associated with the protein complex, and to our understanding of its function in cellular metabolism.

Protection of α -Amylase by Group II A Elements Against Denaturation by Urea. J. M. Wakim, R. Thornberg, and H. McClanahan, University of Tennessee at Martin.

B. Subtilis α -amylase is denatured by urea and by guanidine hydrochloride (GuHCl). The extent of enzymatic activity recovered depends on the incubation period with the denaturing agents. GuHCl is more effective denaturing agent than urea.

Ca^{++} , at $10^{-4}M$ concentration, protects the enzyme against denaturation by both reagents; however, Ca^{++} protects the enzyme to a lesser extent against GuHCl. Sr^{++} and Ba^{++} also protect the enzyme but not to the same extent as Ca^{++} . Mg^{++} has no effect on the rate of inactivation of the enzyme by urea. Also, Na^{++} has no effect on the rate of inactivation. In contrast, Zn^{++} at $0.1M$ concentration enhances the rate of inactivation.

The inactivation is believed to be due to aggregation or due to conformational changes. Further research using physical chemical methods is needed to ascertain the cause(s) of inactivation.

Studies on Sterol Metabolism by a Mixed Function Oxidase of Rat Liver Microsomes. R. Crowder and R. R. Brady, Memphis State University.

Demethylation of 4-methylsterols is catalyzed by a mixed function oxidase in rat liver microsomes. Investigation of oxidase activity has been facilitated by use of 4-hydroxymethylcholesterol-7-en-3-one as a model substrate. Initial investigations have shown the oxidation in the presence of 4-hydroxymethylcholesterol-7-en-3-one to be essentially the same as oxidative activity for 4-methylsterols. Interaction of NADPH with the oxidase was investigated using 4-hydroxymethylcholesterol-7-en-3-one as substrate. Variation of NADPH from $1 \times 10^{-6}M$ to $1 \times 10^{-4}M$ caused an atypical change in reaction rate. A multiphasic curve resulted in which velocity increased, decreased and increased again. The kinetics were indicative of at least two separate sites of interaction for NADPH with the oxidase. Using reciprocal plots, apparent K_m values for the two sites were determined to be 6.5×10^{-7} and 7.7×10^{-6} .

Variant Residues and Rates of Protein Evolution. T. Chirpich, Memphis State University.

Proteins differ greatly in their sequences. As an explanation for the observed variations, this report presents evidence in 3-*s*-ting that proteins in general are subject to the same amount of structural constraint and that the rates of mutation acceptance by different proteins reflect the relative abilities to maintain structure when amino acids are replaced. The basic argument is that structure can be maintained if an amino acid replacement is conservative and that the number of acceptable replacements for any amino acid is proportional to an empirical mutability term derived from a comparison of protein sequences. This one term encompasses such diverse effects as the tendency of hydrophobic residues to be replaced by other hydrophobic residues and the tendency of helix formers to be replaced by other helix formers. A total mutability term can be calculated for each protein and is correlated with the rate of mutation acceptance by that protein.

Acetylcholinesterase and Excitable Membranes. James E. Bulger, Memphis State University.

Evidence is presented that one of the major species of acetylcholinesterase found in homogenates of fresh tissue from the electric organ of *Electrophorus electricus* consists of some type of complex between acetylcholinesterase and other component(s).

At low ionic strength this species migrates on sucrose gradients as a membrane-bound enzyme. At high ionic strength the enzyme activity can be dissociated and is identified as a species having a sedimentation coefficient of $\sim 17S$. This association-dissociation phenomenon appears to be reversible and the complex formed behaves differently from aggregated acetylcholinesterase.

Further studies are being carried out to determine the nature of the complex.

Binding of Calcium-45 to Excitable Membranes. A. S. Hitt and J. E. Bulger, Memphis State University.

Preliminary studies indicate binding of calcium to one or more proteins present in membrane preparations from the electroplex of *Electrophorus electricus*. The amount of calcium bound is affected by the cholinergic effectors, carbamylcholine and d-tubocurarine.

GEOLOGY AND GEOGRAPHY SECTION

Mrs. Phyllis M. Garman, Chairman

Interpretation of Pattern and Depth of Faulting in New Madrid region of the Mississippi Embayment. Richard G. Stearns and Ann Zurawski, Vanderbilt University.

Geologic Hazards in Tennessee. John Wiethe, Tennessee Division of Geology.

Comparison of Point Count, X-Ray, and Visual Estimate Methods of Determining Dolomite Percentages in Limestones. David N. Lumsden and Tong C. Haw, Memphis State University.

How to Save a Marsh—A Chronicle of Efforts to Preserve Amnicola Marsh, Hamilton County, Tennessee. Robert L. Wilson, University of Tennessee at Chattanooga.

Inferred Tidal Flat Paleoenvironments Observed in Exposures of the Leipers Limestone Ordovician in an Abandoned Quarry near I-24, Dade County, Georgia. James McCullough and Richard E. Bergenback, University of Tennessee at Chattanooga.

Interpretation of Pattern and Depth of Faulting in New Madrid Region of the Mississippi Embayment. Richard G. Stearns and Ann Zurawski, Vanderbilt University.

The New Madrid Region is an area of concealed faults. Interpretive faults are located by means of Low's anomalous structure contour method along with topographic lineations and known faults.

The fault pattern is primarily a northeast-trending fault system. Faults trend north-northeast parallel to the Mississippi River, radiating to the NE in Kentucky. West of the river in Missouri and Arkansas, faults trend NE with a strong tendency to curve southward. The zone of curving is both in the trough of the Mississippi Embayment syncline and over the crest of the buried Paleozoic Pascola Arch, which has been crossfolded by the Embayment. The most recent faults (cutting Quaternary alluvium) occur in the Mississippi River alluvial plain.

Most faults determined by such structural data are only known to involve Paleocene to Recent deposits. They could be superficial, extending downward only to the Cretaceous-Paleozoic unconformity and not directly related to earthquakes. However,

the fault location and strike directions given by seismic solutions (work of Nuttli and his students) coincide with those of structurally determined faults, suggesting that many of these surface faults extend to focal depth and are still active.

Geologic Hazards in Tennessee. John Wiethe, Tennessee Division of Geology.

The term environmental geology may be displeasing to some geologists, but more importantly, the term serves to focus the attention of the nongeologist on the critical need for geologic input in planning and inventory. Environmental geology involves not only matters of site specific impact problems, but also its application to the inventory of natural systems and the formulation of long range guidelines for prevention of future impact problems. Geologists can provide an important service by insisting on proper input of geology into their state and local land use planning system.

An environmental geologic approach will reveal natural hazards such as; slope, instability, flooding, solution collapse, erosion and sedimentation which commonly occur in Tennessee. While they are generally minor problems in terms of cost, when added up, the cost becomes staggering, both as taxpayers and as individual property owners.

Comparison of Point Count, X-ray, and Visual Estimate Methods for Determining Dolomite Percentages in Limestones. D. N. Lumsden and T. C. Haw, Memphis State University.

Wayne Group (Silurian) carbonates of the Western Highland Rim, Tennessee were analyzed for their dolomite content by visual estimates of Alizarin Red stained thin sections. To verify these results selected samples were also analyzed by both point counting and X-ray diffraction techniques. The point count and visual estimates agreed very closely but the initial X-ray results disagreed with point count results by a factor that averaged $\pm 25\%$ and varied systematically with the amount of dolomite present. This systematic lack of agreement was resolved when a correction for non-stoichiometry was applied to the X-ray technique. Thereafter correlation between all three techniques was good however the X-ray technique usually gave lower values than either point count or visual estimates. We conclude that visual estimates are the preferred technique due to their rapidity. However, care must be taken to insure that the estimates are based on representative fields of view.

How to Save a Marsh—A Chronicle of Efforts to Preserve Amnicola Marsh, Hamilton County, Tennessee. Robert L. Wilson, University of Tennessee at Chattanooga.

The Amnicola Marsh occupies some 53 acres of a 380-acre tract within the urban area of Chattanooga, Tennessee. This area possesses an array of biotic communities which are unique to this area. The geologic formation and future are subject to several interpretations. Since this land has a high value for economic development many civic leaders felt that every effort should be made to preserve this remarkable ecosystem. After a series series of meetings for the time being the Southern Railway (owners of the property) were willing to allow approximately 78 acres to remain in its natural state.

Inferred Tidal Flat Paleoenvironments Observed in Exposures of the Leipers Limestone (Ordovician) in an Abandoned Quarry Near Interstate 24, Dade County, Georgia. James McCullough and Richard E. Bergenback, University of Tennessee at Chattanooga.

Several paleoenvironments have been recognized, as part of an ancient Tidal Flat complex, in exposures of the Leipers Limestone (Ordovician) in an abandoned quarry near Interstate 24, Dade County, Georgia.

The paleoenvironments include:

- | <i>Facies</i> | <i>Interpretation</i> |
|--|---------------------------------|
| 1. Birdseye structures in pelsparites (microspar cement) | High intertidal to supratidal |
| 2. Laminated, rippled, mud-cracked, burrowed (vertical burrows), low angle cross-bedded, pellet-rich, dolomitized with green shale laminae | Low to high intertidal |
| 3. Ancient gastropod shell coquinas | High subtidal to low intertidal |

MATHEMATICS SECTION

V. R. R. Uppuluri, Chairman

Some Mathematical Models Used in Radiation Dose Calculations. George G. Killough, Oak Ridge (20 min.)

Linear Difference Equations and Linear Differential Equations: A Striking Parallel. Sherwood S. Evey, The University of the South (20 min.)

Estimation of Ordered Parameters and Its Applications in Medical Trials. Hubert J. Chen, Memphis State University (20 min.)

A Question Concerning Jacob's Matrices. C. C. Rousseau, Memphis State University (20 min.)

Brick Partitions and 2-Cells. Richard Slocum, The University of Tennessee at Martin (20 min.)

Moments of Order Statistics from Generalized Logistic Distribution. S. A. Patil, Tennessee Technological University (20 min.)

The Generalization of Fractional Integrals. M. K. Jain, University of Tennessee at Martin (20 min.)

Some Mathematical Models Used in Radiation Dose Calculations. George G. Killough, Oak Ridge.

Mathematical models aid in calculating the distribution of radioactive material in the body following its ingestion, inhalation, or introduction via other pathways. The dose to an organ of the body is computed as a function of the organ's time-integrated burden of a radionuclide. The retention of a radionuclide burden in most organs of the body is modeled by one or more parallel compartments; metabolic depletion of each compartment's content is usually assumed to follow an exponential law, but power-function rate coefficients are also sometimes used. While the retention of a radionuclide in the respiratory system also is often represented by parallel exponential compartments, some of these are associated with mechanical clearance of material, while others account for absorption into blood. Modeling the gastrointestinal tract is complicated by the irregular movement of its contents from one segment to another. Four-segment models (stomach, small intestine, upper large intestine, and lower large intestine) are commonly used, with primary absorption of radionuclide into blood assumed to take place in the small intestine. These models are represented by first-order systems of linear ordinary differential equations.

Linear Difference Equations and Linear Differential Equations: A Striking Parallel. Sherwood F. Ebey, The University of the South.

This expository paper will briefly review the outline of the theory of linear differential equations as it might be presented to students in a calculus class or an introductory course in differential equations. Following this, the theory of linear difference equations will be discussed and the parallel results of the two theories will be pointed to. Finally the paper will discuss two elementary examples related to finite difference equations: the Fibonacci numbers and the classical gambler's ruin problem.

Estimation of Ordered Parameters and Its Applications in Medical Trials. Hubert J. Chen, Memphis State University.

Suppose that we are given k populations with cumulative distributions. The goal is both point and interval estimations of the smallest parameter. The appropriate estimator of the parameter is a series of ordered values, based on a mutually independent random sample of size n from a population. It is shown that the estimator is both asymptotically unbiased and strongly consistent. Interval estimation is considered for various distributions. A direct application for medical trials is stated

as follows: Suppose that there are k drugs to cure one same disease. Use the method proposed above one can estimate the best drug (the next best, etc.) by both point and interval.

A Question Concerning Jacobi Matrices. C. C. Rousseau, Memphis State University.

Investigation of the eigenvalue of the infinite Jacobi matrix relating to the analytic continuation of the perturbation series by means of the Padé approximant.

Brick Partitions and 2-Cells. Richard Slocum, University of Tennessee at Martin.

Brick partitionings have been used to characterize 2-spheres and 2-manifolds. Each of the proofs depends upon showing that a subset of a space is a 2-cell. Yet there is no known proof of an interesting 2-cell characterization using brick partitionings. Certainly, Zippin's characterization of a 2-cell should be obtainable using brick partitionings.

Moments of Order Statistics from Generalized Logistic Distribution. S. A. Patil, Tennessee Technological University.

An ordered sample of n independent and identically distributed random variables from a generalized logistic distribution with a cumulative distribution function. For this distribution the moment generating function of the i th order statistic is derived. A relation between the moment generating functions of the original distribution and its order statistic is obtained. The covariance is explicitly obtained in terms of di-gamma and tri-gamma functions. The variance co-variance matrix so obtained is used to find the best linear unbiased estimators of the location and scale parameters when either a complete or a censored sample is available from the generalized logistic distribution.

The Generalization of Fractional Integrals. M. K. Jain, University of Tennessee at Martin.

Fractional integrals have been extensively studied. These integrals have been generalized in several ways. We have generalized them in a manner which gives us Laplace Transform as limiting cases. We have also defined Fractional integrals in n variables. Although we have not yet directed ourselves to the question of generalization of the Fractional multiple integrals. However strong possibility of generalization exist which will give us Laplace Transform as limiting cases.

MEDICAL SCIENCES SECTION

T. C. Helvey, Chairman

Cell Cycle Time and Duration of Mitotic Phases of a Lymphoid Cell Line Grown in Heterologous Sera. John A. Ndon, B. R. Jennings, J. M. Mason, W. A. Simpson, University of Tennessee Center for the Health Sciences (15 min.)

Failure of Concanavalin-A to Induce Prozone Phenomenon in Rabbit Erythrocyte Agglutination. W. A. Simpson, Jr., J. M. Mason, B. R. Jennings, University of Tennessee Center for the Health Sciences (10 min.)

The T-Cell Rosette Test: A measure of Cellular Immune Response in Squamous Cell Carcinoma of the Head and Neck. R. Jack Eastham, III, James M. Mason, B. R. Jennings, Patricia Belew, University of Tennessee Center for the Health Sciences.

Platelet Satellites of Mononuclear Leucocytes. Patricia Belew, R. Jack Eastham, B. R. Jennings, and J. M. Mason, University of Tennessee Center for the Health Sciences (15 min.)

Problems of Rural Health Care Delivery. Woneal Jones,

Comprehensive Health Planning Council, Columbia, Tennessee (15 min.)

Fluorescent Thyroid Scanning and the Diagnosis of Thyroid Nodules. J. A. Patton, J. Hollifield and A. B. Brill Division of Nuclear Medicine, Vanderbilt University Medical Center (15 min.)

Sudden Infant Death Syndrome (SIDS) in Twins. J. M. Mason, J. T. Francisco, University of Tennessee Center for the Health Sciences (10 min.)

A Comparison of the Innervation of Vibrissae (Sinus Hairs) and Surrounding Hairlets in the Mouse. Marion H. Garrett, University of Tennessee Center for Health Sciences (15 min.)

Clinical Experience with Lithium Carbonate. Alvin J. Summar, M.D., Tennessee Psychiatric Hospital & Institute (10 min.)

Bacterial Fingerprinting with Chemical Ionization Mass Spectrometry. Frederick Petty, Robert C. Rendtorff, and Robert Chandler, University of Tennessee Center for the Health Sciences (15 min.)

Development of a Turbidometric Assay for Low Levels of Ampicillin in Serum and Its Applicability to Clinical Studies. Philip L. Whyatt, Raymond E. Dann, Gerald W. A. Slywka, Marvin C. Myer, University of Tennessee Center for the Health Sciences (15 min.)

Regulation of Bovine Hepatic Fructose 1, 6-Diphosphatase Activity by Calcium Ions. Carol J. Marcus, William L. Byrne, and Arthur M. Geller, University of Tennessee Center for the Health Sciences (10 min.)

Nutritional Status of Selected Low-Income Families in Two West Tennessee Counties. H. A. Bond and O. L. Adams. Meharry Medical College and Tennessee State University (15 min.)

Eating Habits and Patterns of Selected Low-Income Families of Two West Tennessee Counties. M. G. Towns A. B. Bond, and O. L. Adams, Tennessee State University (15 min.)

Ruptured Spleen as a Cause of Sudden Death. J. C. Sapala. University of Tennessee Center for the Health Sciences (10 min.)

Cell Cycle Time and Duration of Mitotic Phases of a Lymphoid Cell Line Grown in Heterologous Sera. John A. Ndon, B. R. Jennings, J. M. Mason and W. A. Simpson, Jr., University of Tennessee Center for the Health Sciences.

A lymphoid cell line designated PGLC-33H had been isolated in continuous suspension culture from the peripheral blood of a patient with infectious mononucleosis. Data have been presented with respect to widely varying serum optima for the growth rate of the cell line. Variations have been observed in the viability studies, growth rate, cell cycle time, and mitotic index of the cell line when exposed to Roswell Park Memorial Institute (RPMI 1640) medium supplemented with varying concentration of heterologous sera. A rapid and convenient method was developed to study the cytomorphology of the cells. The times spent by these cells in prophase, metaphase, anaphase, and telophase were calculated. Variations in these values were found to be related to the growth rate of the cell line in the test media supplemented with the serum under investigation.

Failure of Concanavalin-A to Induce Prozone Phenomenon in Rabbit Erythrocyte Agglutination. W. A. Simpson, Jr., J. M. Mason, B. R. Jennings, University of Tennessee Center for the Health Sciences.

Binding of rabbit erythrocytes (RRBC) by Concanavalin-A (Con-A) as a function of Con-A concentration was determined using tritiated Con-A and liquid scintillation counting. Maximal Con-A binding was demonstrated to occur at a final concentration of less than 2.5% (w/v) of Con-A. Agglutination of RRBC was observed at all Con-A concentrations from 0.005% to 9.5% (w/v). The aggregate formation was easily seen macroscopically and was confirmed microscopically. The failure to induce a prozone at concentrations exceeding the saturation concentration is inconsistent with the classical lattice hypothesis of agglutination. A substitute hypothesis is offered based on localized alterations of electrical charge distribution on the cell surface.

The T-Cell Rosette Test: A Measure of The Cellular Immune Response in Squamous Cell Carcinoma of the Head and Neck. R. Jack Eastman, III, James M. Mason, B. R. Jennings & Patricia Belew, University of Tennessee Center for Health Sciences.

The T-cell Rosette test is a direct measure of the circulating thymus dependent lymphocytes which are important in the cell-mediated destruction of tumor cells. The test is based on the observation that human T-lymphocytes have the ability to bind Non-specifically with sheep red blood cells. This Rosette formation enables the differentiation and quantitation of the T-lymphocytes from the B-lymphocytes.

The T-cell Rosette test is of clinical importance to the surgeon, the Radiotherapist, the chemotherapist and the tumor immunologist, all of whom are involved in the treatment of squamous cell carcinoma of the head and neck. Because combined treatment modalities can alter the host-tumor responses, a direct measurement of the cellular immune response would assist in the development of a more rational treatment sequence which would provide the greatest reduction in tumor cell mass while at the same time preserve the host's T-cell population.

Platelet Satellitism of Mononuclear Leucocytes. Patricia Belew, R. Jack Eastman, B. R. Jennings, and J. M. Mason, University of Tennessee Center for the Health Sciences.

We have observed "platelet satellitism" or adherence of thrombocytes to mononuclear leucocytes obtained from ficoll-hypaque fractions heparinized blood on a series of patients with squamous cell carcinoma of the head and neck. When these mononuclear leucocyte preparations were used in the T-cell rosette test for thymic derived lymphocytes, mononuclear leucocytes satellited with thrombocytes continued to be present. They have been observed in from 3% to 51% of the total cells present on a series of 28 patients. Slightly higher percentages are obtained at 37C. than at 4C. Examination for surface immunoglobulins by immunofluorescence, peroxidase staining, and electron microscopic studies have been made. The ability of these satellited mononuclear cells to adhere to glass or to phagocytize bentonite particles has been examined.

Problems of Rural Health Care Delivery. Woneal Jones, Comprehensive Health Planning Council, Columbia.

Health Care Delivery in urban setting has been perfected to a high efficiency. However, in rural areas, especially in medically underserved districts, the situation has become quite critical. The population density in such areas is detrimental for the attraction of physicians, and the situation is aggravated by the fact that said population is mostly in the low-income brackets. Due to the large distances the transportation in such areas is poor, and so are the means of gathering medical information.

Due to the demographic process, which still has the trend of depleting rural areas, the segment of the American people which needs such services the most, and justifiably so, government assistance for their health care, is presently almost non-existent. The Comprehensive Health Planning Councils which are an arm of the local governments, were well thought out to be the instrument to fill this gap.

This paper describes the merits and importance of the Com-

prehensive Health Planning Councils their advantages, as well as, short-comings in fulfilling the task to provide adequate health care for millions of rural citizens.

Fluorescent Thyroid Scanning and the Diagnosis of Thyroid Nodules. J. A. Patton, J. Hollifield, and A. B. Brill, Vanderbilt University Medical Center.

Fluorescent scanning of thyroidal iodine pools has been a useful diagnostic technique in nuclear medicine at Vanderbilt for the past three years. With this procedure the thyroid gland is irradiated point-by-point with an external source of radiation (Am-241) and the resultant x-rays of iodine emitted from the gland are counted by a high resolution Si(Li) detector. Thus one obtains an intensity map corresponding to the stable iodine distribution in the thyroid. The scanning system is interfaced to a computer and calibration equations have been derived so that milligram quantities can be assigned to the gland or to parts of the gland. This technique has provided a new parameter for predicting the histology of thyroid nodules that are "cold" to radioisotope studies. In this method, the ratio of iodine content in the nodule to that in corresponding area of the contralateral lobe is used as an indicator of the probability of malignancy. To date, of 33 patients who have gone to surgery, 15 patients had nodule/normal ratios below 0.6. Twelve of these 15 had malignant nodules. The remaining 18 patients had ratios above 0.6 and all 18 had benign nodules. Thus it appears, that the iodine content of a nodule is an excellent indicator of its histology.

Sudden Infant Death Syndrome (SIDS) in Twins. J. M. Mason and J. T. Francisco, University of Tennessee Center for the Health Sciences.

In Shelby County there occur over 2.5 sudden infant death syndrome (SIDS) deaths per 1000 live births. This is the leading cause of death in the group from two weeks to one year of age, and accounts for about half the deaths in this age range. A study was undertaken to evaluate the possibility that familial linkage could be a predisposing factor in this disease. Thus, an attempt was made to find from death certificates filed in the Medical Examiner's Office (J.T.F.) whether siblings associated with a previous SIDS event were more likely to die from SIDS than were persons not a sibling of previous SIDS victim. The only significant increased risk was in twins, but that increase was quite large. This is consistent with an infectious disease etiology of at least a portion of SIDS deaths.

A Comparison of the Innervation of Vibrissae (Sinus Hairs) and Surrounding Hairlets in the Mouse. Marion H. Garrett, University of Tennessee Center for Health Sciences.

Vibrissa innervation. A large bundle of nerve fibers enters the lower part of the sinus surrounding the vibrissa follicle. Its branches arrange themselves around the follicle. Some of the nerve fibers end in the connective tissue around the lower part of the follicle. Other fibers pass upward to the ring sinus, where some contact Merkel cells in the outer root sheath. In the area just below the sebaceous gland a ring of nerve fibers is formed. Some fibers pass into the conical body and terminate around the small sinuses of that region.

Hairlet innervation. A small bundle of nerve fibers passes to the follicle of the hairlet just below the level of the sebaceous gland. These fibers encircle the follicle; some give off branches which pass upward. The sides of these branches are covered by extensions of Schwann cells which have foot-like processes attached to the basal lamina of the outer root sheath.

Clinical Experience with Lithium Carbonate. Alvin J. Summar, M.D., Tennessee Psychiatric Hospital and Institute.

Review of Lithium as ion and Lithium compounds. Historical look at Lithium compounds in the U.S. and Europe. Lithium Carbonate treatment of selected patients prior to FDA approval of its use. The psychiatric use of Lithium in clinical practice today. The safety of the use of Lithium Carbonate by the general physician and the ease of laboratory determination of Lithium blood levels. Motivation of patient, family, physician and laboratory director to utilize Lithium therapy. Case reports:

Early toxicity (patient variability, renal disease, etc.). Lithium therapy in patients with thyroid disease. Lithium therapy in a patient with small bowel resection for obesity (and other complications). Lithium therapy in depression. Lithium therapy for prophylaxis in the "stable" manic-depressive person.

Bacterial Fingerprinting with Chemical Ionization Mass Spectrometry. Frederick Petty, Robert C. Rendtorff, and Robert W. Chandler, University of Tennessee Center for the Health Sciences.

A new technique has been developed, using a computerized chemical ionization mass spectrometer, whereby whole bacteria are pyrolyzed directly into the source of the mass spectrometer, whence the isobutane chemical ionization mass spectrum is recorded. Preliminary studies with *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus faecalis*, *Neisseria gonorrhoeae*, and *Streptococcus pyogenes* indicates that the spectra thus obtained are not only qualitatively different but readily and reliably differentiated and identified by an on-line computer spectral library search system. The entire process (i.e., inserting and pyrolysing sample, obtaining spectra, and computerized identification of bacteria) requires about two minutes. Experiments in progress will be discussed, as well as potential applications in the medical sciences.

Development of a Turbidometric Assay for Low Levels of Ampicillin in Serum and its Applicability to Clinical Studies. Philip L. Whyatt, Raymond E. Dann, Gerald W. A. Slywka, and Marvin C. Meyer, University of Tennessee Center for the Health Sciences.

A turbidometric assay is described for the quantitative measurement of ampicillin in serum. Standard curves prepared with known concentrations of ampicillin in serum exhibited acceptable linearity over a concentration range of approximately 0.2 to 1.8 ug/ml. Data are presented to show the excellent precision of the assay and the application of the assay to clinical studies. The advantages of this method over other procedures are discussed. Because of the questionable stability of ampicillin, samples containing known concentrations of ampicillin in serum were assayed after storage for various lengths of time. Serum samples maintained in the frozen state until the time of assay exhibited approximately 12% degradation after 7 days, while those samples which were subjected to repeated thawings and refreezing exhibited approximately 25% degradation after the same time interval.

Regulation of Bovine Hepatic Fructose 1,6-Diphosphatase Activity by Calcium Ions. Carol J. Marcus, William L. Byrne, and Arthur M. Geller, The University of Tennessee Center for the Health Sciences.

Purified bovine hepatic fructose 1,6-diphosphatase is inhibited by calcium ions. Reciprocal plots of velocity versus magnesium concentration at different calcium concentrations indicate that inhibition by calcium is competitive with magnesium. A replot of the slopes versus calcium concentration is parabolic indicating that more than one mole of calcium binds per mole of enzyme. Hill plots of the data show that as the magnesium concentration is increased, the cooperativity changes from positive to negative. At magnesium concentrations of less than 1 mM, calcium inhibition is positively cooperative; at 5 mM Mg²⁺, there is essentially no cooperativity; and above 5 mM Mg²⁺, calcium inhibition shows negative cooperativity. Changes in the concentration of calcium and magnesium ions in the liver cell may therefore be of significance in the regulation of the activity of this enzyme.

Nutritional Status of Selected Low-Income Families in Two West Tennessee Counties. Moses, H. A., Meharry Medical College, Bond, A. B. and O. L. Adams, Tennessee State University.

Thirty-five families from Hardeman and Lauderdale Counties, Tennessee, selected on the basis of a nutrition survey, participation and income level, were given physical examinations which included dental examinations, vital signs, anthropometric measurements and blood and urine collections for biochemical analysis.

Data from chemical analyses suggested that thiamine intake, total serum protein and serum albumin were not health problems. However, riboflavin did appear to be a potential problem.

Factors indicative of susceptibility to iron-deficiency anemia were found in varying percentages among the subjects. Finding sickle cell anemia was rare with the sickle cell trait being found in a small percentage of the subjects.

Low to deficient serum vitamin A values and calcium deficiencies were found.

The general overall health conditions of the families studied may be stated as poor.

Eating Habits and Patterns of Selected Low-Income Families in Two West Tennessee Counties. Towns, M. G., Bond, A. B. and O. L. Adams, Tennessee State University.

One hundred seventeen families (Blacks, Whites and Indians) with an average of 7.81 persons per family from Hardeman and Lauderdale Counties were included in this survey of eating habits and patterns.

Meals were planned and served at home in a high percentage of families, however, there was a sharp decrease in the percentage eating meals together.

Meal preparation was found to be the responsibility of the homemaker with other members assisting.

Attitude about eating certain foods due to superstitions was not a problem. Food dislikes limited the variety and economy in meal preparation.

Food intake as determined by 24-hour recall suggested that hunger for lack of food was not a problem among the families studied, though some homemakers felt that there were times when enough food was not on the table.

Evaluation of food intake by food groups did suggest that malnutrition could become a more serious problem.

Ruptured Spleen as a Cause of Sudden Death. Joseph C. Sapala, University of Tennessee Center for the Health Sciences.

This is a case of a 19 year old male who died suddenly and unexpectedly. His entire life and family history was negative for disease. An autopsy revealed an enlarged ruptured spleen with intraperitoneal hemorrhage. Laboratory tests were confirmatory for infectious mononucleosis.

PHYSICS AND ASTRONOMY SECTION

Raymond L. Tanner, Chairman

The Kapitza Effect in HeI and HeII. Franklin C. Mason and Charles F. Mate, Middle Tennessee State University (15 min.)

A Course in Acoustics for Music Majors. Michael M. Garland, Memphis State University (15 min.)

Radiating Temperature of the Ozonosphere During Total Solar Eclipse. E. A. Barnhardt and W. H. Brune, Southwestern at Memphis (15 min.)

Imaging in Nuclear Medicine. Robert John Wilson, University of Tennessee Center for the Health Sciences (12 min.)

Study of HeI Emission Lines in the Solar Atmosphere. J. L. Streete, Southwestern at Memphis (12 min.)

Holography for Nondestructuve Testing—Theory. Albert Wollett, Memphis State University (12 min.)

Holography for Nondestructuve Testing—Practical. Maurice C. McGee, Memphis State University (12 min.)

Use of Computer for Planning Radiation Therapy

Treatments. R. Harold Galbraith, University of Tennessee Center for the Health Sciences (12 min.)

Present and Future Opportunities in Health Physics. Lewis B. O'Kelly, Memphis State University (15 min.)

Physics at Technical Institutes. George P. Carney, State Technical Institute at Memphis (10 min.)

The Kapitza Effect in He I and He II. Franklin C. Mason and Charles F. Mate, Middle Tennessee State University.

The Kapitza effect at a copper surface has been measured in both liquid helium I and helium II. By using a specially designed conductance cell, with a gap width of only 3×10^{-4} m, to obtain a direct comparison of the thermal boundary resistances in these fluids, it is shown that there is no large scale discontinuity in the Kapitza effect at the He I-He II phase transition. Thus a hitherto unsupported speculation regarding the behavior of the boundary resistance at the transition temperature is verified, and previously reported "indications" of an order of magnitude change at the transition are denied validity. To within the precision of the measurements (1% for smoothed data, 10% point by point) the Kapitza effect is the same in the "normal" liquid phase (He I) as in the "superfluid" phase.

A Course in Acoustics for Music Majors. Michael M. Garland, Memphis State University.

For the past three years an experimental course in acoustics for music majors has been taught at Memphis State. This two semester sequence is essentially non-mathematical with emphasis placed on lecture demonstrations and laboratory exercises. Topics include the acoustics of traditional instruments, room acoustics, the human ear, electronic recording and reproduction, and music synthesizers.

Radiating Temperature of the Ozonosphere During Total Solar Eclipse. E. A. Barnhardt and W. H. Brune, Southwestern at Memphis.

The effective radiating temperature of the ozonosphere can be measured from the ground using an infrared spectrometer. The temperature determination involves the measurement of the absorption and re-emission of energy in the 9.6 micron absorption band of ozone. Since the ozonosphere is not an isothermal layer, the temperature measured was not the actual temperature but an effective radiating temperature. This particular experiment was devised to detect the change in ozone temperature when the source of ozone production, the radiation from the sun's photosphere is suddenly extinguished. The experiment was performed at Loiyengalani, Kenya, $36^{\circ} 42.2'$ East Longitude and $2^{\circ} 44.7'$ North Latitude.

Imaging in Nuclear Medicine. R. J. Wilson, University of Tennessee Center for the Health Sciences.

The two major imaging systems in Nuclear Medicine are the scanner and the Anger type camera. Descriptions are given of the collimation, electronics, and output of these devices. Similarities and differences are pointed out for the two instruments.

Study of He I Emission Lines in the Solar Atmosphere. J. L. Streete, Southwestern at Memphis.

To understand the excitation of helium in different parts of the solar atmosphere, data on the intensities of lines from the triplet and the singlet systems are of prime importance. Because they are the farthest removed from the continuum, the best lines with which to study the He I excitation are the infrared lines with which to study the He I excitation are the infrared triplet lines at 10830 Å and the corresponding line in the singlet series at 20581 Å. Measurements of the intensity ratio of these two lines made at the High Altitude Observatory's observing station at Climax, Colorado and at Loiyengalani, Kenya during the total solar eclipse of June 30, 1973 will be discussed.

Holographic Non-Destructive Testing-Theory. Albert Wollett, Memphis State University.

A simple picture is considered for visualizing the occurrence of fringes in double-exposure holograms.

Holographic Nondestructuve Testing-Practice. Maurice C. McGee, Memphis State University.

Basic equipment and techniques used in holographic interferometry are discussed, as well as applications of holographic interferometry to nondestructive testing.

Use of Computer for Planning Radiation Therapy Treatments. R. Harold Galbraith, University of Tennessee Center for the Health Sciences.

The ultimate goal in treatment planning is to generate a desired combination of radiation beams in such a way as to give maximum dose to the tumor area and minimum dose to the surrounding healthy tissue. Sometimes this can be accomplished by a single beam of radiation directed at the tumor volume; but much of the time, multiple beams are required to keep certain areas below destructive levels.

A cross-sectional contour of the patient is mapped out and possible field combination are considered to give the best resultant isodose distribution. To perform this by hand is a very laborious task and usually only one plan can be utilized; but with interactive computers, the summation can be done in a few seconds, and a variety of plans can be compared.

Present and Future Opportunities in Health Physics. Lewis B. O'Kelly, Memphis State University.

The increasing use of nuclear energy for electrical power generation and use of radioisotopes in medicine and industry are creating a shortage of trained health physicists and health physics technicians. Job opportunities and educational requirements for these fields will be discussed.

Physics at Technical Institutes. George P. Carney, State Technical Institute at Memphis.

A discussion of the level of physics and mathematics taught in Engineering Technology programs. Technical Institutes in the United States and in the state of Tennessee will be discussed considering their growth potential, job potential for graduates, background and degrees needed by faculty.

SCIENCE AND MATHEMATICS TEACHERS SECTION

Carl Stedman, Chairman

The Implementation of ESS Through NSF Funding: Some Principles and Problems. William N. Pafford, East Tennessee State University, and Charles W. Gee, Milligan University (15 min.)

Problems Encountered in Large School Systems in Implementing New Curricula. Harriet Crump and Fred D. Johnson, Shelby County Schools (20 min.)

The Innovative Science Curriculum Projects of Recent Years: Where Are They Headed? Ronald B. Childress, The University of Tennessee (20 min.)

The Use of the Computer in First Year College Chemistry. Helen S. Randolph and Ann P. Minter, Roane State Community College (20 min.)

Environmental Education: An Experimental Community Problem Focused Approach for High School Students. Jack Rhoton, Kingsport City Schools (20 min.)

The Implementation of ESS Through NSF Funding: Some

Principles and Problems. William N. Pafford, East Tennessee State University, and Charles W. Gee, Milligan University.

The Elementary Science Study (ESS) is a National Curriculum Project in elementary science. Such projects are often successfully implemented in school districts through NSF funding of Instructional Improvement Implementation Projects. If funding of such projects is likely, however, school districts must show evidence of financial commitment and a sincere desire to improve the science curriculum. The project normally involves a cooperating college or university.

Some possible problems with such projects are selection of capable participants; selection of appropriate units of ESS; released time for in-service sessions; and difficulty of effective evaluation of the project. Another factor which may pose problems for some school districts is the fact that money allocated for textbook purchases may not be utilized to purchase kits such as ESS units.

Problems Encountered in Large School Systems in Implementing New Curricula. Harriet Crump and Fred Johnson, Shelby City Schools.

Abstract not submitted for publication in JTAS.

The Innovative Science Curriculum Projects of Recent Years—Where are they Headed? Ronald B. Childress, The University of Tennessee at Knoxville.

During the past decade and a half science educators at all levels have been confronted with a host of innovative curriculum projects and programs. Financed primarily through federal government and foundation appropriations, these somewhat revolutionary approaches to science instruction were advanced as curealls for the many ills of science education. More recently, in the midst of an aura of decreasing external financial support and mounting professional criticism, the status of many of these projects and programs has become seriously threatened.

During the Spring of 1974, a representative sample of science curriculum project and program directors were questioned concerning present operational status, recent significant developments, and projected activities for their projects. An analysis of the study findings suggests major directional and orientational changes for those projects and programs remaining operational.

The Use of the Computer in First Year College Chemistry. Helen S. Randolph and Anne P. Minter, Roane State Community College.

The Chemistry Department at Roane State Community College is using computer programs as instructional aids in general chemistry courses. These programs cover such topics as introduction to laboratory and the metric system, problem sets, and review of lecture material. The students have access to terminals to rerun programs as many times as the students wish. Student response to this type of supplemental instruction has been very enthusiastic.

Environmental Education: An Experimental Community Problem-Focused Approach For High School Students. Jack Rhoton, Kingsport City Schools.

High school students in the seventies have exhibited vivid and genuine concern for environmental issues. The judicious teacher attempting to channel this curiosity into truly comprehensive problem-focused learning experience is many times inhibited when confronted with the organizational constraints of the typical school day. Endeavoring to overcome such restraints, the Kingsport City School System requested and received permission from the State Department of Education to offer an experimental community environmental problem-focused course for high school students during the summer of 1974. Continuing for four weeks, this course was directed toward providing sufficient opportunities for secondary level students to conduct indepth investigations of local environmental problems. Data and reports developed as a part of these research efforts were forwarded to appropriate agencies, businesses and governmental officials.

ZOOLOGY SECTION I

Eric L. Morgan, Chairman

Preliminary Investigation of the Tardigrada from Epiphytes on Beeches, Buckeyes, and Sugar Maples on Roan Mountain, Tennessee. Diane R. Nelson, East Tennessee State University (10 min.)

Culture of Channel Catfish in Recirculating Systems. Meryl C. Broussard, Jr. and Bill A. Simco, Memphis State University (15 min.)

Design and Application of an In-Line Biomonitoring System. Margaret W. Davis and Eric L. Morgan, Tennessee Technological University (15 min.)

Effects of Some Environmental Variables on the Profundal Benthic Macrofauna in McKellar Lake, Shelby County, Tennessee. Paul F. Hendrix, Memphis State University (15 min.)

Benthic Macroinvertebrate Communities of a Naturally Acid Stream in the Great Smoky Mountains National Park. Robert Lynn Green and Eric L. Morgan, Tennessee Technological University (15 min.)

Influence of Anakeesta Formation Leachate on the Shovel-Nosed Salamander (*Leurognathus marmoratus* Moore) of the Great Smoky Mountains National Park. Raymond C. Mathews, Margaret Davis, Eric L. Morgan, Theresa J. Mathews, Tennessee Technological University (15 min.)

Evaluation Procedures to be Employed in a Study of the Effects of Channelization and Mitigation Structures in Crom Creek, Tennessee. C. M. Bishop and R. Glesne and P. V. Winger, Tennessee Technological University (15 min.)

An Easily Constructed Artificial Substrate Sampler for Evaluation of Benthic Macroinvertebrates. Bill Oakley and Parley V. Winger, Tennessee Cooperative Fisheries Unit, Tennessee Technological University (15 min.)

The Distribution of Larval Fish in Old Hickory Reservoir (Cumberland River) near Dixon Springs, Tennessee in 1974. Timmy B. Hess and Parley V. Winger, Tennessee Cooperative Fishery Unit, Tennessee Tech University (15 min.)

Locomotor Activity Patterns of Normal and Blinded Channel Catfish *Ictalurus punctatus* (Osteichthyes, Ictaluridae) under Various Lighting Regimes. Robert H. Blackshear and Kenneth B. Davis, Memphis State University (15 min.)

Diurnal Measurement of Plasma Corticosteroids in Fresh- and Salt-Water Adapted Channel Catfish (*Ictalurus punctatus*) Kenneth B. Davis and Charles R. Patterson, Memphis State University (12 min.)

Summer Food Habits and Growth of Young of the Year Black Bass of Center Hill Reservoir. Charles Coomer Jr., Tennessee Technological University (15 min.)

Preliminary Investigation of the Tardigrada from Epiphytes on

Beeches, Buckeyes, and Sugar Maples on Roan Mountain, Tennessee. Diane R. Nelson, East Tennessee State University.

Tardigrades were collected from 45 samples of epiphytic mosses on beeches (*Fagus grandifolia*), buckeyes (*Aesculus octandra*), and sugar maples (*Acer saccharum*) at an altitude of 4000 feet on the north-facing slope of Roan Mountain, Carter County, Tennessee. The number of samples per tree species and per individual tree, mean number of tardigrade species per sample and per tree, and total number of tardigrade species were very similar regardless of the phorophyte. However, examination of the frequency data revealed significant variation in the tardigrade fauna on the three tree species. Further investigation involving a larger sample size is necessary to confirm the variability and to examine contributing factors.

Culture of Channel Catfish in Recirculating Systems. Meryl C. Broussard, Jr., and Bill A. Simco, Memphis State University.

Channel catfish can be cultured at high densities in indoor recirculating systems using biological filters. Daily gains of up to one pound per 100 gallons of water with standing crops of up to 13.2 pounds per cubic foot have been obtained. Food conversions remained below 1.5 under normal operating conditions. Submerged, updraft and trickling filters with various types of filter materials have successfully removed toxic metabolic waste products. Water quality and the carrying capacity of a system are directly affected by filter size, flow rates and fresh water exchange.

Ammonia, carbon dioxide, oxygen and temperature have apparently limited fish production in our systems at various times. Poor water quality or other stresses may result in disease outbreaks which spread rapidly in recirculating systems. Temporary mechanical failures may result in high mortalities in such a system. As culture techniques and water quality control improve, recirculating systems may become an increasingly important method of fish culture.

Design and Application of an In-Line Biomonitoring System. Margaret W. Davis and Eric L. Morgan, Tennessee Technological University.

The development of a rapid biological system which measures changes in breathing rates of fish is discussed. The possible implementation of this system at an industrial site to monitor toxicity in their wastes and receiving streams is described. Various techniques required in the application of this system are related. These include: (1) design of test chamber and accompanying electronics; (2) acclimation procedures; (3) system evaluation in spill conditions; (4) preparation and dilution methods of toxicants used; (5) methods of recording, reading, and interpreting data; (6) correlation of biological responses with known chemical data; and (7) proposed methods of introducing this system into an in-plant situation.

Effects of Some Environmental Variables on the Profundal Benthic Macrofauna in McKellar Lake, Shelby County, Tennessee. Paul F. Hendrix, Memphis State University.

A one year benthological study was conducted in a culturally eutrophic, slack water lake of the Mississippi River. Thirteen environmental and biological variables were measured and subjected to multivariate analyses in an attempt to relate environmental conditions to the abundance and distribution of the profundal benthos. Multiple regression analyses related 48.9% of the variation in organisms/m² to water depth and pH, and 13.2% of the variation in numbers of genera to dissolved oxygen levels. UPGMA cluster analysis separated the variables into two distinct groups, the first relating to water temperature and organic content, and the second to organism abundance and mineral properties of the water; the first group correlated negatively with the second. Principal components analysis defined the first three principal components accounting for 93.9% of the total variation in the environmental and biological variables. A three-dimensional projection of the sampling points onto the three components demonstrated the effectiveness of this analysis in describing the relationships among the variables.

Benthic Macroinvertebrate Communities of a Naturally Acid Stream in the Great Smoky Mountains National Park. Robert Lynn Green and Eric L. Morgan, Tennessee Technological University.

A one year study, terminating May, 1974, was conducted on the water quality and benthic macroinvertebrate communities of Walker Camp Prong, a naturally acid stream located in the Tennessee portion of the Great Smoky Mountains National Park. The acid stress received by Walker Camp Prong is produced from the oxidation and dissolution of pyritic materials of the Anakeesta Formation occurring naturally in the streambed base rock. Chemical analyses revealed low pH and alkalinity and high acidity, hardness, and sulfate. Preliminary analysis of the benthic macroinvertebrate communities yielded diversity values (H) less than two, high redundancy, and low density—all indicative of moderate to heavy stress. Predominant taxa in severely stressed regions of the stream were Chironomidae and *Lirceus* sp. while members of the non-tolerant taxa Plecoptera and Ephemeroptera predominated at less severely affected regions.

Salamander (Leurognathus marmoratus Moore) of the Great Smoky Mountains National Park, Raymond C. Mathews, Margaret Davis, Eric L. Morgan, Theresa J. Mathews, Tennessee Technological University.

The effects of various concentrations of anakeesta leachate were tested on the shovel-nosed salamander (*Leurognathus marmoratus* Moore) from the Smoky Mountains National Park. Anakeesta formations in the park are part of the mineralized geological belt extending from Georgia to Virginia that is characteristically high in pyritic materials. Since the completion of U.S. Highway 441 in 1963 on an overlook near Newfound Gap, it was noted that a small creek, Beech Flats Creek, downstream of the road fill was devoid of salamanders. During a one year study extending from June 1, 1973 to May 31, 1974 on the effects of acid drainage on benthic macroinvertebrate communities in this stream, the water downstream from the fill had a pH of 4.33-5.51 and upstream water had a pH of 6.05-7.50. Upstream of the road fill, the creek supports an abundant salamander population, dominated by *Leurognathus marmoratus* Moore, the shovel-nosed salamander.

A 96-hour time-to-death (hourly) bioassay helped establish concentrations of anakeesta leachate toxic to this species. Saturated anakeesta water (pH 3.9, conductivity 140 μMHOS) at 12°C±0.5°C was exposed to nine salamanders each at percent concentrations of 100, 63, 48, 45, 37 and a control respectively via a continuous flow Esvelt Serial Diluter. Toxicity generally increased with increasing concentrations of anakeesta leachate.

Evaluation Procedures to be Employed in a Study of the Effects of Channelization and Mitigation Structures in Crow Creek, Tennessee. C. M. Bishop, R. S. Glesne and P. V. Winger, Tennessee Technological University.

Channel alterations generally result in a significant reduction in the quality of the lotic environment, which indicates a need for implementation of rehabilitation measures if we are to maintain the integrity of our rivers and streams. To better understand the effects of channelization and rehabilitation measures on the aquatic habitats, a study was recently initiated on Crow Creek, Tennessee, which has been extensively channelized and has had approximately 40 instream structures installed for gradient stabilization and mitigation purposes. Thirteen one-quarter-mile study sections have been established which include a control area, a snag-clear area, channelized areas without structures, channelized areas with structures, and two unaltered oxbow areas. Parameters to be analyzed are benthic populations, periphyton, fish populations, fish distribution with regard to habitat diversity, water quality, and physical characteristics of channels. The information gained from this evaluation should provide insight into the value of the employed mitigation measures on Crow Creek and the establishment of guidelines for future rehabilitation measures.

An Easily Constructed Artificial Substrate Sampler for Evaluation of Benthic Macroinvertebrate Fauna. Willard E. Oakley, and P. V. Winger, Tennessee Technological University.

A frequent criticism of using artificial substrate samplers for the quantitative evaluation of benthic macroinvertebrate populations is that organisms are washed off during the retrieval process. To alleviate this problem an artificial substrate sampler was designed that employed a cover device to prevent loss of organisms. The sampler was constructed of a sheet metal frame and hardware cloth cone attached to a bottom metal pan with a center eye bolt. The conical shield was constructed of 26 gauge sheet metal with two side openings covered with nylon netting and with weights affixed to the sides. Retrieval is accomplished by dropping the shield down the cable until it slips over the sampler and then the entire apparatus can be pulled to the surface. Preliminary data are being gathered at the present time on the efficiency of this sampling technique in the biological evaluation of the benthic fauna of the Cumberland River near the proposed site of the Hartsville nuclear power plant.

The Distribution of Larval Fish Populations in Old Hickory Reservoir (Cumberland River) near Dixon Springs, Tennessee. T. B. Hess and P. V. Winger, Tennessee Technological University.

The distribution of larval fish populations was determined in Old Hickory Reservoir (Cumberland River) near Dixon Springs, Tennessee. This study is part of the biological evaluation being conducted near the proposed Hartsville Nuclear Power Station. Collections were made weekly from 5 April through 15 August, 1974 at various depths at six locations. Samples were collected with a one-meter diameter conical net with a mesh size opening of 0.79 mm and affixed with a 1.5 liter collecting bucket.

A total of 5,556 fish representing 19 taxa with a range of mean (x) concentrations from 37.84 fish per 10m³ in a creek backwater area to 0.90 fish per 10m³ near the surface at mid-channel of the river were collected during the study. Three distinct peak concentrations were noted indicating periods of major taxa emergence. The results suggest that spatial, as well as temporal, distribution of larval fish is not uniform in this type of mainstream impoundment.

Locomotor Activity Patterns of Normal and Blinded Channel Catfish, *Ictalurus punctatus*, (Osteichthyes, Ictaluridae) under Various Lighting Regimes. Robert H. Blackshear and Kenneth B. Davis, Memphis State University.

Locomotor activity patterns of normal and blinded channel catfish were studied under constant temperature and three lighting programs of 12 hours light—12 hours dark, constant light, and constant dark. Photocells connected to an event recorder were used to measure activity of fish housed in rectangular and octagonal (circular) chambers.

Normal channel catfish exhibited nocturnal locomotor activity under 12 hours light—12 hours dark at four different intensities of illumination. Arrhythmic, non-circadian activity was observed in constant conditions. Both blinded and normal fish obeyed Aschoff's Rule by showing suppressed locomotor activity when subjected to increasing intensities of constant illumination. Nonvisual light reception was indicated in channel catfish with regard to regulation of the amount of locomotor activity but not to the timing of the activity.

Diurnal Measurement of Plasma Corticosteroids in Fresh- and Salt-water Adapted Channel Catfish (*Ictalurus punctatus*). Kenneth B. Davis and Charles R. Patterson, Memphis State University.

Plasma 11-OH-corticosteroids were determined fluorometrically at two times of day in channel catfish (*Ictalurus punctatus*) maintained in either fresh water or 7 ppt salt water at 23 ± 2 C. A diurnal variation was apparent in salt water. A plasma titer of 18.5 ± 4.1 μg/100ml was found at 0800, and was significantly

higher ($p = 0.01$) than the 1500 value of $3.2 \pm 1.0 \mu\text{g}/100\text{ml}$. No diurnal variation was detected in fish from fresh water. The 0700 fresh water sample ($4.9 \pm 1.0 \mu\text{g}/100\text{ml}$) was significantly lower ($p = 0.01$) than the 0800 salt water sample, but it was not statistically different from the 1400 fresh water sample ($4.2 \pm 1.2 \mu\text{g}/100\text{ml}$).

Summer Food Habits and Growth of Young of the Year Black Bass of Center Hill Reservoir. Charles Coomer, Jr., Tennessee Technological University.

During June, July, and August of 1974, the food habits of young of the year of three species of bass in Center Hill Reservoir, located near Smithville, Tennessee, were investigated. The three species observed were *Micropterus salmoides*, *M. punctatus*, and *M. dolomieu*.

Length and weight of each fish were taken and the stomach contents examined. All three species exhibited an early dependence on invertebrates as a source of food; as the size and age of the bass increased, the occurrence of fish in the diet also increased. The composition of stomach contents were similar for all three species.

ZOOLOGY SECTION II

Charles H. Nelson, Chairman

Species and Size Selectivity of Gill Nets and Electro-fishing at Nickajack Reservoir, Tennessee. Tom J. Timmons, Tennessee Technological University (15 min.)

Reproductive Cycle of the Eastern Spiny Softshell Turtle, Trionyx spinifer spinifer. Keith M. Robinson, Middle Tennessee State University (15 min.)

The Occurrence of Phytomonas Elmssiani (Migone) (Protozoa: Trypanosomatidae) in the Milkweeds of Wilson County, Tennessee. Phillip L. Huddlestone and Ralph Sharp, Middle Tennessee State University (10 min.)

A Female Sterile Mutant in Drosophila melanogaster. D. B. Benner, East Tennessee State University (15 min.)

The Bacteriostatic Inhibition of Human Transferrins. Thomas H. Lawrence, III, Charles J. Biggers, and Paul R. Simonton, Memphis State University (15 min.)

Some Teratogenic Effects of Diethylstilbestrol in Chick Embryos. John M. Mallette, University of Tennessee, Nashville and Michael Singleton, Tennessee State University (15 min.)

Response of Mouse Lymphocytes to Varying Dose Rates. P. S. Rushton and H. M. Lacy, Memphis State University (10 min.)

Effects of Noise on Adrenal Weights of Mus musculus. Ronald K. Chesser, Ronald S. Caldwell, and Michael J. Harvey, Memphis State University (15 min.)

Electrolyte Balance and Urine Production in Ictalurus punctatus. V. M. Norton and K. B. Davis, Memphis State University (10 min.)

Fishery Survey of Ocoee Reservoir No. 4, Copperhill, Tennessee. Robert L. Martin and Eric L. Morgan, Tennessee Technological University (15 min.)

A Preliminary Evaluation of Aquatic Zoobenthos of

the Ocoee River Basin, Tennessee. John—Walter S. the Ocoee River Basin, Tennessee. John-Walter S. Foster and Eric L. Morgan, Tennessee Technological University (15 min.)

Some Effects of Sewage Effluent from the Cookeville Sewage Treatment Plant on the Diversity of Fish and Benthic Macroinvertebrates of Pigeon Roost Creek and Falling Water River. Kenton D. Smithson, Tennessee Technological University (10 min.)

Species and Size Selectivity of Gill Nets and Electro-fishing at Nickajack Reservoir, Tennessee. Tom J. Timmons, Tennessee Technological University.

Experimental gill nets and electrofishing were used to determine the relative abundance and species composition of the fishes in Nickajack Reservoir near the Raccoon Mountain Pumped-Storage Plant. Of the 47 species collected, 33 were collected in gill nets and 39 by electrofishing. There were 14 species collected by electrofishing not taken with nets, and of these, 10 were too small to have been caught in the smallest mesh size. Centrarchids were the most abundant numerically in the electrofishing results (63.3%), while only 20.6% were collected by gill nets. Gizzard shad was the dominant species in gill nets (34.0%) and represented 26.7% of the electrofishing results. Gar and catfishes were more often caught with gill nets.

The Reproductive Cycle of the Eastern Spiny Softshell Turtle, Trionyx spinifer spinifer. Keith M. Robinson, Middle Tennessee State University.

The reproductive cycle of the Eastern Spiny Softshell Turtle, *Trionyx spinifer spinifer*, was studied April 1971-June 1974.

Mature females weighed 1413-3586 g. Follicles began to enlarge in July, increased in size through summer and fall, and reached ovulatory size by the following May. Ovulation occurred in May or June and egg-laying occurred in June or July. Corpora lutea were detectable for 1-2 months following ovulation. Clutch size and the number of enlarged ovarian follicles were positively correlated with body size. Data indicated that large females perhaps produced a second clutch. Extra-uterine migration occasionally occurred.

Mature males weighed 133-503 g. The spermatogenic cycle began in April. Spermatogonia were the most abundant in May, spermatocytes were most abundant in June and July, spermatids were most abundant in August, and spermatozoa were most abundant in September. Abundant spermatozoa were found in the epididymides of all mature males examined.

The Occurrence of Phytomonas elmssiani (Migone) (Protozoa: Trypanosomatidae) in the Milkweeds of Wilson County, Tennessee. Phillip L. Huddlestone and Ralph Sharp, Middle Tennessee State University.

A total of 1,726 plants belonging to the family Asclepiadaceae was examined in Wilson County, Tennessee, of which 788 were found infected with *Phytomonas elmssiani*. *Asclepias syriaca*, *A. incarnata*, and *A. tuberosa* were the species of milkweeds examined in this study. The infection rate was found to increase during the milkweed's growing season. Of the 324 *A. syriaca* examined in October 1973, 241 (74%) were infected with the flagellate.

The insect host of *P. elmssiani* is *Oncopeltus fasciatus* (Dallas) (Hemiptera: Lygaeidae). Several of the lygaeids were placed in cages near Watertown (Wilson County), Tennessee in the fall of 1973 to determine if they could survive through winter in this region. No survivors were seen upon examination of the cages the following spring. The results of this experiment would seem to indicate that *O. fasciatus* overwinters in a more southerly region. This research appears to agree with previously reported evidence that *O. fasciatus* is a migratory insect.

A Female Sterile Mutant in Drosophila melanogaster. D. B. Benner, East Tennessee State University.

A new mutant which results in reduced egg production in *Drosophila* females has been isolated from the progeny of a

single "wild type" female. Eighteen of these females produced an average of 92 progeny from a single mating compared to an average of 223 progeny from 41 Oregon R females. The ovaries do not develop normally, and most of the ovarioles contain only immature stage oocytes. The position of the mutant has not been determined.

The Bacteriostatic Inhibition of Human Transferrins. Thomas H. Lawrence, III, Charles J. Biggers, and Paul R. Simonton, Memphis State University.

Three human transferrin variants were identified by vertical slab polyacrylamide gel electrophoresis, verified by the rivanol procedure, isolated by elution convection, and their bacteriostatic inhibition against *Klebsiella pneumoniae* was measured. The inhibition against human transferrin variants exhibit different degrees of inhibition at the same protein concentration of transferrin.

Some Teratogenic Effects of Diethylstilbestrol in Chick Embryos. John M. Mallette, University of Tennessee, and Michael Singleton, Tennessee State University.

Recent research findings indicate that diethylstilbestrol may be directly related to positive pap smears in women whose mothers were given injections of Diethylstilbestrol during parturition. The purpose of the present study is to determine what specific effects, if any, does diethylstilbestrol have on chick development. Minimum lethal dosages were obtained and it was found that .005 c.c./gram weight of Diethylstilbestrol would induce the following morphological aberrations when compared to un.injected and sham injected controls: (1) Formation of cysts in the lower urinary tract. (2) Impairment of body growth. (3) Formations of pituitary lesions.

Response of Mouse Lymphocytes to Varying Dose Rates of X-Irradiation. P. S. Rushton and Hilda M. Lacy, Memphis State University.

Lymphocytes are more sensitive to radiation than any other mature body cells. In an effort to explain this phenomenon, three groups of *Mus musculus* were given a total dose of 400R with a 250KVp x-ray machine at different dose rates: 8R/minute, 45.5R/minute, and 82R/minute. Twenty four hours after irradiation, spleen weights and total lymphocyte numbers were determined for each mouse and a control group. Numbers of lymphocytes and spleen weights of the irradiated groups were decreased significantly over those of the control group. No significant differences were found among the three dose rate groups. These results suggest that lymphocytes may lack a repair mechanism which may partially explain their radiosensitivity.

Effects of Noise on Adrenal Weights of Mus musculus. Ronald K. Chesser, Ronald S. Caldwell, and Michael J. Harvey, Memphis State University.

House mice, *Mus musculus*, were snap-trapped from two similar fields near Memphis International Airport, Shelby County, Tennessee, the only apparent difference being the presence or absence of low flying aircraft. Airport field noise levels ranged from 80 to 120 db while rural field levels ranged from 80 to 85 db. Mice from the airport field had significantly larger adrenal glands than those of the rural field. To determine if noise was the causative stressful factor, mice were collected from the rural field and subjected to recorded jet aircraft noises at 105 db in the laboratory for 2 wk. The experimental group had significantly larger adrenals than those of a control group.

Electrolyte Balance and Urine Production in Ictalurus punctatus. V. M. Norton and K. B. Davis, Memphis State University.

Urine electrolytes and the rate of urine production were monitored in fresh water adapted channel catfish, *Ictalurus punctatus* (Rafinesque). The urinary bladder was surgically cannulated and urine continuously collected for up to four days. Urine and electrolyte excretion rates were measured on 24 hour samples beginning 24 hours post-surgery on five fish. Urine volume averaged 111.4 ml/Kg/24h and electrolyte excretion

rates were as follows: sodium 0.73 mEq/Kg/24h, potassium 0.27mEq/Kg/24h, and chloride 0.46 mEq/Kg/24h.

Fishery Survey of Ocoee Reservoir No. 3, Tennessee. Robert L. Martin, and Eric L. Morgan, Tennessee Technical University.

The purpose of this two year survey on Ocoee Reservoir No. 3 is to evaluate the: 1) adult fish species composition; 2) age class composition; 3) sources of recruitment to the reservoir population; 4) larval fish population; and 5) fish productivity of the reservoir.

The reservoir is subjected to several stresses; siltation, acids, thermal effluent, and a combination of heavy metals. These have limited the fishery population to two large embayments from the main channel each with tributary streams.

Sampling methods employed to achieve project goals are still netting, electroshocking, and larval fish tows. Electroshocking has been performed using a 110 D.C. current from a boat-generator system. Larval fish collections will be made at various sites. A ten minute tow of half meter nets from a boat will be taken along each bank and middle channel, shallow and deep.

A Preliminary Evaluation of the Aquatic Zoobenthos of the Ocoee River Basin, Tennessee. John W. S. Foster, III and Eric L. Morgan, Tennessee Technological University.

Preliminary studies have shown that the Ocoee River in the Copper Basin, Tennessee, has been acutely stressed for more than 100 years by the wastes from copper refining operations located there, and the excessively high amounts of sediment entering the river from the denuded hillsides of the Basin. This study was initiated to assess the aquatic zoobenthic community structures for a one year period prior to the removal of certain waste components by pollution abatement systems.

Zoobenthological samplings made periodically between the fall of 1973 and the fall of 1974 have shown species diversity indices well below those considered representative of a severely stressed stream downstream from the industrial operations. In the town of Copperhill, (0.5 miles upstream from the industry) and in unaffected reference streams, diversity values generally showed a moderate or very healthy aquatic ecosystem.

A continuing study of the Ocoee River is to be conducted to assess primary productivity, zoobenthos, fisheries, and bioassay tests of sediments, silt, and various components of the industrial effluent. It is expected that certain components of the aquatic ecosystem will show substantial recovery progress from one to five years after abatement systems are operational.

Some Effects of Sewage Effluent on the Ecology of a Stream Ecosystem. K. D. Smithson, Tennessee Technological University.

The effects of the Cookeville, Tennessee municipal sewage effluent on Pigeon Roost Creek and on its receiving stream, Falling Water River, were studied. Conditions were most severe at the head of Pigeon Roost Creek, below the outfall. The average dissolved oxygen concentration here was 7 mg/l (range 3-12 mg/l), while chlorine had an average value of 0.1 mg/l (range 0.0-0.4). The bluegill was the only fish collected immediately below the outfall while the benthic population was dominated by tubificid oligochaetes. The average species diversity (H) for benthic macroinvertebrates immediately below the treatment plant was 0.22 and 0.51 for surber and multiple plate artificial substrate samples. Conditions improved 8 km downstream just before the confluence with Falling Water River. The average species diversity at this point had increased to 0.92 and 0.76 for surber and multiple plate artificial substrate samples. The benthic population here was dominated by tubificid oligochaetes and chironomids, while eight species of fish were collected. Data from Falling Water River showed recovery 3.2 km. below the confluence with Pigeon Roost Creek.

COLLEGIATE DIVISION

Richard J. Raridon, Chairman

An Analysis of Some Cross-bedded Deposits in the Sewanee Conglomerate (Pennsylvanian), Sewanee, Ten-

nessee. Ted Doss III, University of the South, and Richard E. Bergenback, University of Tennessee at Chattanooga (15 min.)

Inferred Tidal Flat Paleoenvironments Observed in Exposures of the Leipers Limestone (Ordovician) in an Abandoned Quarry near Interstate 24, Dade County, Georgia. James McCullough and Richard E. Bergenback, University of Tennessee at Chattanooga (15 min.)

Petrology of a Core of the Tusculumbia Limestone (Mississippian Equivalent of St. Louis Limestone) Taken on Pigeon Mountain Southwest of Lafayette in Walker County, Georgia. Mark Herndon and Richard E. Bergenback, University of Tennessee at Chattanooga (15 min.)

Herpetomonas drosophila Transferred to Musca domestica. Milton W. Riley and Myrtle Fleming, Lee College (10 min.)

Lethal Concentrations of Residual Chlorine at Various Temperatures on Crayfish (*Orconectes rusticus*). Raymond C. Mathews, Theresa Jo Mathews, and Art D. Bosnak Tennessee Technological University (10 min.)

The Influence of Dose-time Factors on the Life Cycle of HeLa Cells Exposed to Ionizing Radiation. James B. Mitchell, George Peabody College and Vanderbilt Hospital, Department of Radiotherapy (15 min.)

An Electrophoretic Investigation of Murine Hemoglobin and Serum Proteins. Mark A. Castellaw, Memphis State University (15 min.)

The Effect of Industrial Pollution on the Loosahatchie River Ecosystem. Sharon Meador and Steve Bills, Southwestern at Memphis (30 min.)

Family Pedigree of Widows Peak. Joey R. Bartlett, Carson-Newman College (10 min.)

An analysis of some cross-bedded deposits in the Sewanee Conglomerate (Pennsylvanian), Sewanee, Tennessee. Ted Doss III, University of the South, and Richard E. Bergenback, University of Tennessee at Chattanooga.

Asymptotic and planar cross-beds have been recognized in lee-side, inferred underwater dune deposits of the quartzose Pennsylvanian Sewanee Conglomerate in a roadcut along U.S. 64 near the entrance to the University of the South, Sewanee, Tennessee.

Deposition of these cross-beds can be explained by a fluid mechanics model developed by A. V. Jopling (1962).

Inferred Tidal Flat paleoenvironments observed in exposures of the Leipers Limestone (Ordovician) in an abandoned quarry near Interstate 24, Dade County, Georgia. James McCullough and Richard E. Bergenback, University of Tennessee at Chattanooga.

Several paleoenvironments have been recognized, as part of an ancient Tidal Flat complex, in exposures of the Leipers Limestone (Ordovician) in an abandoned quarry near Interstate 24, Dade County, Georgia.

The paleoenvironments include:

Facies	Interpretation
1. Birdseye structures in pel-sparites (microspar cement)	High intertidal to supratidal

2. Laminated, rippled, mud-cracked, burrowed (vertical burrows), low angle cross-bedded, pellet-rich, dolomitized with green shale laminae

Low to high intertidal

3. Ancient gastropod shell coquinas

High subtidal to low intertidal

Petrology of a core of the Tusculumbia Limestone (Mississippian equivalent of St. Louis Limestone) taken on Pigeon Mountain southwest of Lafayette in Walker County, Georgia. Mark Herndon and Richard E. Bergenback, University of Tennessee at Chattanooga.

Detailed petrographic examination of over 100 feet of core from the chert-rich Tusculumbia Limestone (Mississippian equivalent of the St. Louis Limestone) taken on Pigeon Mountain southwest of Lafayette, Georgia, has revealed several facies which include:

1. Dolomitized micrite.
2. Fossiliferous micrite with very fine- to medium-grained bryozoan and echinoderm debris.
3. Very fine- to medium-grained, packed biomicrite rich in bryozoan and echinoderm debris with lesser superficial oolites.
4. Fine- to medium-grained, packed, rounded biosparite rich in echinoderm and bryozoan grains with lesser superficial oolites.
5. Fine- to medium-grained, packed oosparite consisting of mature and superficial oolites.

Herpetomonas drosophila Transferred to Musca domestica. Milton W. Riley and Myrtle Fleming, Lee College.

Herpetomonas drosophila were maintained in artificial garbage for periods up to 36 hours. Musca domestica were exposed to milk and yeast solution containing Herpetomonas drosophila. Four days later, Herpetomonas drosophila were found in the Musca domestica. Clean Musca domestica were placed in a chamber of Drosophila melanogaster that were infected with Herpetomonas drosophila. Herpetomonas drosophila were found in 20 Musca domestica.

Lethal Concentrations of Residual Chlorine at Various Temperatures on Crayfish (*Orconectes rusticus*). Raymond C. Mathews, Theresa J. Mathews, Art D. Bosnak, Tennessee Technological University.

Lethal concentrations of residual chlorine at various temperatures on crayfish (*Orconectes rusticus*) were tested on specimens collected from Taylor Creek, in the Cumberland Plateau region of middle Tennessee. Water chemistry analysis was made of the collecting area and experimental chlorinated water solutions with a HACH WATER CHEMISTRY KIT (Model DR-EL).

The bioassay apparatus consisted of three 5-gallon containers, corresponding to three different concentrations of chlorinated water (0.05, 0.10, 1.00 mg/l) and sealed with plastic bags at the air/water interface. Vacuum filter flask, six for each concentration, served as test chambers, with one crayfish per flask, connected to the 5-gallon containers via rubber tubing. Water entering the flasks through glass tubing projecting near bottom of flasks through one-hole stoppers displaced with chlorinated water through side vent thus replacing with new chlorinated water. Water baths were used to maintain constant temperatures. Crayfish mortalities were continually monitored the duration of the bioassay.

The chlorine concentrations at the various temperatures were lethal to the crayfish. Chlorine was most toxic at the warm temperature extreme (35°C). Chlorine was more toxic at room temperature (25°C) than at the cool temperature (8°C) except at the 1.0 mg/l concentration.

The Influence of Dose-Time Factors on the Life Cycle of HeLa Cells Exposed to Ionizing Radiation. James B. Mitchell, George Peabody College and Vanderbilt Hospital.

The response of synchronized HeLa cells was examined for

dose-rate and multiple dose fractionation schedules all designed to give an average dose-rate of 37 rads per hour. Time lapse cinematographic studies during irradiation at 35 rads per hour with $^3\text{H}_2\text{O}$ confirmed and extended previous observations concerning the production of a mitotic block in HeLa cells by gamma rays at approximately this dose-rate. Acute dose fractionation with interfraction intervals of 1/2, 1, 2, 4, 8, 12, and 16 hours also prevented cell division, and further experiments using 12-hour fraction intervals suggested that a mitotic block is also involved. It appears, therefore, that continuous irradiation and acute dose fractionation, at least for 12-hour fraction intervals, produce effects on the life cycle that are indistinguishable for an average dose-rate of 37 rads per hour.

An Electrophoretic Investigation of Murine Hemoglobin and Serum Proteins. Mark A. Castellaw, Memphis State University.

The objective of this study was to survey the blood proteins of feral populations of house mice and compare to other studies in the literature. Electrophoretic comparisons were made of the serum proteins and hemoglobins of mice collected from West Tennessee and Northern Mississippi. General proteins, esterases, and hemoglobin were stained for specifically and the gels were scanned by a densitometer. The transferrins were identified by Rivanol precipitation. Results indicate that C57 BL/6J and the wild mice captured are identical in hemoglobin and serum protein patterns. This correlates with previous work reported. In contrast to the single transferrin band of unconcentrated serum with starch gel as reported by others, the polyacrylamide gel showed two transferrin bands.

The Effect of Industrial Pollution on the Loosahatchie River. Steve Bills, and Sharon Meador, Southwestern at Memphis.

In recent years, numerous fish kills have occurred on the

Loosahatchie River. It is believed that industrial ammonia pollution is the major factor involved in these fish kills.

The goals of this project were:

1. to study the ammonia concentration fluctuation in the Loosahatchie River above and below the major industrial output sites;
 2. to study the effects of ammonia and nitrite on the respiration and growth of *Chlamydomonas reinhardtii*;
 3. to study the correlation between methemoglobin concentration in channel catfish and environmental nitrite concentration;
 4. to study the gross physiological effects of varying concentrations of environmental ammonia on channel catfish.
- The results obtained from these studies are included in the final report.

Family Pedigree of Widow's Peak. Joey R. Bartlett, Carson-Newman College.

Widow's peak is commonly characterized by the downward sloping of the hairline terminating in a sharp point on the brow. To date there has been little genetic study applied to widow's peak. A search of the literature revealed no pedigrees in journals or books known to me. Although some speculations and hypotheses have been advanced by two authors, A. M. Winchester and Amram Scheinfeld, no data has been found to accurately support them. The purpose of this study was to obtain information which might prove beneficial to a better understanding of the inheritance of the character widow's peak. Winchester (1958) says the phenotype is inherited as a result of the action of a certain dominant gene (w). He also notes that the phenotypic study is clouded by the inheritance of the gene for baldness. This study encompasses a total of five generations, in which 326 individuals were tabulated, among which 121 (or almost one-half) showed the widow's peak phenotype.

THE TWENTY-SIXTH ANNUAL FISK INSTITUTE

Three intensive one-week courses in "Infrared and Raman Spectra Interpretation", "Gas-Liquid Chromatography", and "Meeting EPA and OSHA Standards through IR and GC Techniques" will be held at Fisk University, Nashville, Tennessee, 11-15 August 1975.

The Interpretation of Infrared and Raman Spectra course is led by Dr. Clara D. Craver, Owner, Chemir Labs and Editor, Coblenz Society Catalog of Infrared Spectra, and Dr. Norman Colthup, co-author of a standard text "Introduction to IR and Raman Spectroscopy. The courses will stress its 5 daily workshops where students will immediately test out the methods of analysis of spectra presented to them in the daily lectures.

The Gas-Liquid Chromatography course lectures will be given by Dr. Richard S. Juvet, Jr., of Arizona State University, Dr. Stuart Cram of Varian-Aerograph, Dr. James Miller of Drew University and Dr. J. T. Watson of Vanderbilt University. Dr. David T. Stafford of the University of Tennessee Medical School will coordinate the extensive afternoon laboratory program.

The "Meeting EPA and OSHA Standards . . ." course is offered for the first time. Following presentation in summary

form of the infrared spectroscopic and gas chromatographic techniques for analysis of environmental pollutants, the faculty will review and interpret Environmental Protection Agency and Occupational Safety and Health Agency standards for guarding against environmental pollution. The afternoons will be used for practical laboratory demonstrations and experiments so that industrial and governmental personnel will get "hands-on" experience in using these monitoring techniques.

Faculty for the pollution monitoring course will include Dr. William F. Herget of the U.S. Environmental Protection Agency, Dr. Robert Hannah of Perkin-Elmer Corporation, Dr. Paul Wilks of Wilks Scientific Corporation, Dr. R. S. Javet, Jr. of Arizona State University, Drs. Henry Morgan and Percy Staats of Oak Ridge National Laboratory and others.

Enrollment in each of these three Fisk Institute courses is limited to 50 students. The tuition fee is \$220.00, but half tuition scholarships for academic personnel are sometimes available. A \$10.00 registration fee should accompany applications.

For further information write: The Director, Fisk Institute, Box 8, Fisk University, Nashville, Tennessee 37203.