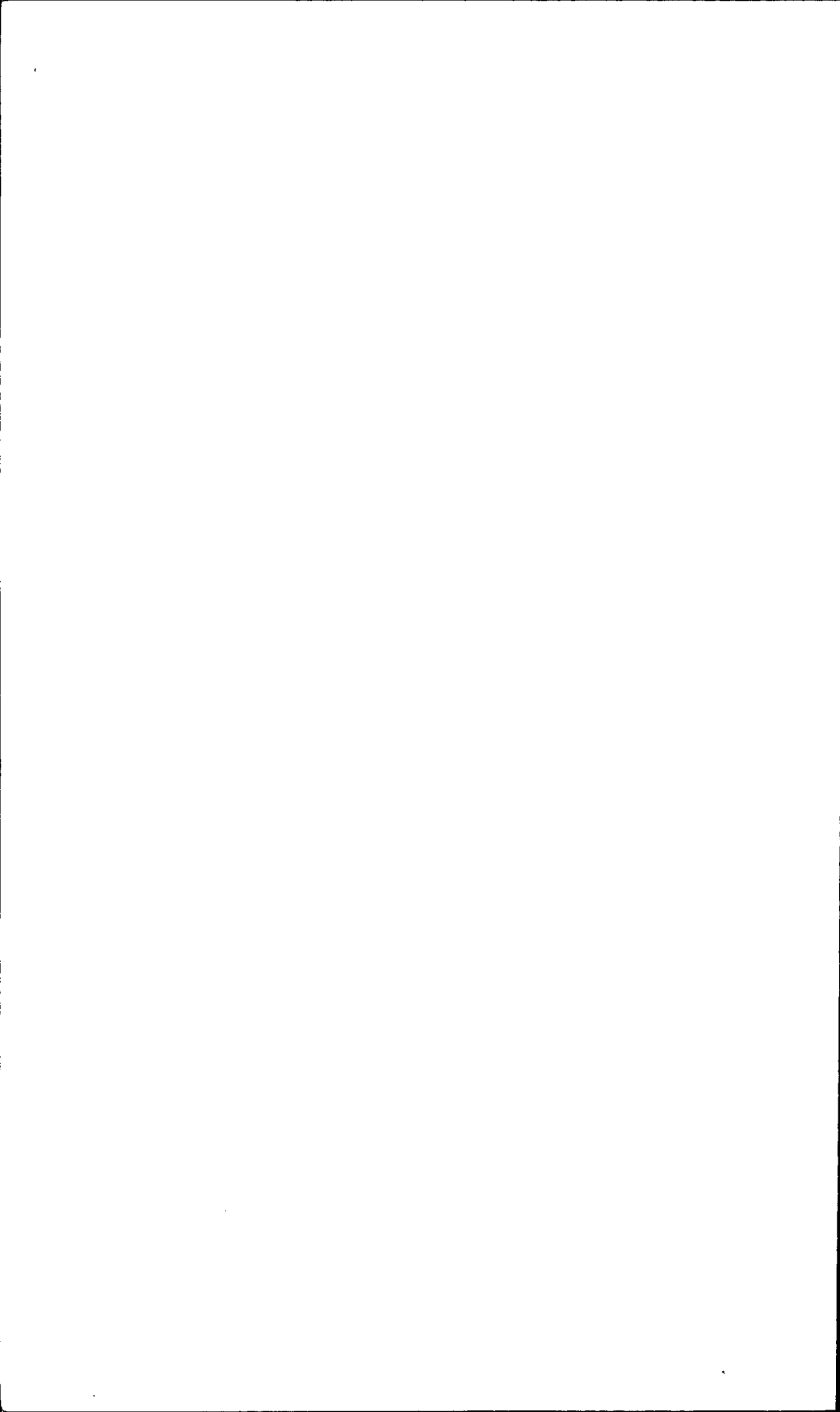


*Lieber
Glaser*

**PROCEEDINGS
of the
FIRST ANNUAL
XAVIER-MSBS
BIOMEDICAL
SYMPOSIUM**

April 8, 9, and 10, 1973

XAVIER UNIVERSITY OF LOUISIANA
NEW ORLEANS, LOUISIANA 70125



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XAVIER UNIVERSITY OF LOUISIANA
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1973 BIOMEDICAL SYMPOSIUM COMMITTEE

Dr. Joyce H. Corrington, Chairman
Xavier University of Louisiana

Dr. Portia U. Ashman
Xavier University of Louisiana

Mr. Lawrence Carter
Dillard University

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Tulane University School of Medicine

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Dr. Leonard Price
Xavier University of Louisiana

Dr. Paul Sacco
Xavier University of Louisiana

Dr. Clyde E. Smith
Southern University in New Orleans

Dr. M. Kay Stanfield
Tulane University School of Medicine

PROGRAM

SUNDAY, April 8, 1973

REGISTRATION AND MIXER, 6:00-7:00 p.m.
Gold Room, Xavier University Student Center

RECEPTION BANQUET, 7:00-8:30 p.m.
Rush Room, Xavier University Student Center

Chairman: Joyce H. Corrington, Ph.D.,
Xavier University

8:00 p.m. WELCOMING REMARKS. Norman C. Francis, J.D.,
President, Xavier University

8:10 p.m. THE CURRENT STATUS OF THE MINORITY SCHOOLS
BIOMEDICAL SUPPORT PROGRAM. Robert J. Gibbs,
Ph.D., Chief, General Research Support Branch, Division of
Research Resources, National Institutes of Health.

MONDAY, April 9, 1973

REGISTRATION, 8:30-10:30 a.m.
Lobby, Xavier University Pharmacy Building

General Session I, 9:00-12:30 a.m.
Auditorium, Xavier University Pharmacy Building

Chairman: Thomas W. Cole, Jr., Ph.D.,
Atlanta University

9:00 a.m. G.1: A REVIEW OF SELECTED ASPECTS OF SICKLE
CELL DISEASE. W. Delano Meriwether, M.D., Harvard
Medical Unit, Boston City Hospital.

10:00 a.m. COFFEE BREAK
Lobby, Xavier University Pharmacy Building

10:30 a.m. G.2: STUDIES IN GENOMIC DEREPRESSION - NORMAL
AND NEOPLASTIC. Merle Mizell, Ph.D., Laboratory of
Tumor Cell Biology, Tulane University.

11:30 a.m. G.3: ENZYME STRUCTURE-FUNCTION RELATIONSHIPS: THE ROLE OF *ESCHERICHIA COLI* P-ENOLPYRUVATE CARBOXYLASE IN REGULATION OF THE CITRIC ACID CYCLE. Thomas E. Smith, Ph.D. Lawrence Livermore Laboratory, University of California.

LUNCHEON, 12:30-2:00 p.m.
Rush Room, Xavier University Student Center

1:30 p.m. SCIENCE CAN BE FUN IF TAUGHT WITH PARABLES
Benjamin H. Alexander, Ph.D., Assistant Chief, General Research Support Branch, Division of Research Resources
National Institutes of Health.

BIOCHEMISTRY: SESSION I, 2:00-3:30 p.m.
Auditorium, Xavier University Pharmacy Building

Chairman: Franklin D. Hamilton, Ph.D., University of Tennessee

2:00 p.m. BC.1: ON THE POSSIBLE INDUCTION OF THE COLLAGENASES IN *CLOSTRIDIUM HISTOLYTICUM*
Collie Pettway, Xavier University

2:15 p.m. BC.2: ISOLATION AND CHARACTERIZATION OF A C₃H/He MOUSE TUMOR VIRUS. G. H. Jackson, Southern University.

2:30 p.m. BC.3: MECHANISM OF ACTION OF POLYCATIONS ON MITOCHONDRIAL OXIDATIVE REACTIONS. D. S. Wong
Texas Southern University.

2:45 p.m. BC.4: INFLUENCE OF SINGLET OXYGEN ON FATTY ACIDS OF VIABLE ATMOSPHERIC PARTICLES. Betty Dowty, Louisiana State University in New Orleans.

3:00 p.m. BC.5: CHEMICAL ANALYSIS OF THE CYST WALL OF *TELOTROCHIDIUM HENNEGUYI*, Lydia Manuel, Dillard University.

3:15 p.m. BC.6: ETHYLENEDIAMINE TETRAACETATE (EDTA) INHIBITION OF ALKALINE PHOSPHATASE FROM NORMAL AND LEUKEMIC TISSUES OF C57BL MICE
Mohammed Yahya, Atlanta University.

BIOLOGY: SESSION I, 2:00-3:30 p.m.

Room 203, Xavier University Pharmacy Building

Chairman: Lawrence Alfred, Ph.D., Federal City College

2:00 p.m. B.1: EFFECTS OF INTRAUTERINE DEVICE (IUD) ON OVARIAN SECRETION OF PROGESTAGENS AND OESTROGENS IN PREGNANT RATS. D. S. M. Prasad, Barber-Scotia College.

2:15 p.m. B.2: EFFECTS OF THE FOLLICLE-STIMULATING HORMONE ON ENZYME ACTIVITY IN THE SERTOLI CELLS OF THE MOUSE TESTIS. Eugene Johnson, Johnson C. Smith University.

2:30 p.m. B.3: PRELIMINARY OBSERVATIONS OF SOME DIURNAL CHANGES IN RATS. Rebecca Chaisson, Xavier University.

2:45 p.m. B.4: THE EFFECT OF DORSAL AXIAL ORGANS ON THE MIGRATION OF PRIMORDIAL GERM CELLS IN *XENOPUS*. F. A. Taylor, Southern University.

3:00 p.m. B.5: LIFE CYCLE OF *BRACHYLAIMUS MICROTI*, A PANCREATIC AND LIVER PARASITE (TREMATODA: BRACHYLAIMIDAE). R. A. Mendoza, The University of Texas at El Paso.

3:15 p.m. B.6: INTRASPECIFIC VARIATION AND HOST RECORDS OF *PHYLLODISTOMUM LACUSTRI* (LOEWEN, 1929). Frederick A. Christian, Southern University.

BOTANY: SESSION I, 2:00-3:30 p.m.

Room 301, Xavier University Pharmacy Building

Chairman: Bharati Mehrotra, Ph.D., Tougaloo College

2:00 p.m. BT.1: THE USE OF COMMELINA AS AN ORGANIC COMPUTER FOR DETECTING EVOLUTIONARY RELATIONSHIPS BETWEEN ANIMALS. Frank R. Davis, Paine College.

- 2:15 p.m. BT.2: LOSS OF PATHOGENICITY OF AGEING CULTURES OF *PSEUDOMONAS TABACI* AND FATTY ACID COMPOSITION. Edith Cheri, Xavier University.
- 2:30 p.m. BT.3: PERFORMANCE OF DIPLOID AND TETRAPLOID *EUPHORBIA LAGASCAE* PLANTS. Jarnail Singh, Stillman College.
- 2:45 p.m. BT.4: PARTIAL PURIFICATION OF MYCOTOXIN FROM *ASPERGILLUS* SPECIES BY ION-EXCHANGE CHROMATOGRAPHY. Pete Jones, Texas Southern University.
- 3:00 p.m. BT.5: A STUDY OF VITAMIN REQUIREMENT IN THE CELLULAR SLIME MOLD, *DICTYOSTELIUM DISCOIDEUM* GROWN IN A SEMI-DEFINED MEDIUM. A. C. Washington, Langston University.
- 3:15 p.m. BT.6: RNA POLYMERASE FROM THE SLIME MOLD *PHYSARUM POLYCEPHALUM*, Joe Johnson, Jr., Atlanta University.

CHEMISTRY: SESSION I, 2:00-3:30 p.m.

Room 204, Xavier University Pharmacy Building

Chairman: Evelyn Garrity, Ph.D., Jackson State University

- 2:00 p.m. C.1: THE CRYSTAL AND MOLECULAR STRUCTURE OF S-(10-PHENOXYARSINYL) PHENOTHIAZONIUM CHLORIDE. Jane Richardson, Xavier University.
- 2:15 p.m. C.2: GAS-SOLID THERMODYNAMIC VALUES FROM PIEZOELECTRIC SORPTION DETECTORS, C. M. Earnest, Stillman College.
- 2:30 p.m. C.3: INDUCED ELECTRON EMISSION SPECTRA STUDY OF ION EXCHANGE CELLULOSES. D. M. Soignet, Southern Regional Research Laboratories, USDA.
- 2:45 p.m. C.4: MOLECULAR ASSOCIATIONS BETWEEN ACETYLCHOLINE AND AROMATIC COMPOUNDS IN AQUEOUS SOLUTION. J. P. Sevenair, Tulane University.

3:00 p.m. C.5: THEORETICAL STUDIES OF DRUG-RECEPTOR COMPLEXES: HISTAMINE CATION - CARBOXYLATE ANION. Arlene Roberson, Xavier University.

3:15 p.m. C.6: MOLECULAR ORBITAL STUDIES OF THE MAST CELL ZINC- HISTAMINE STORAGE COMPLEX. M. F. Murphy, Tulane University School of Medicine.

COFFEE BREAK, 3:30-4:00 p.m.
Lobby, Xavier University Pharmacy Building

DISCUSSIONS ON STUDENT GRADUATE OPPORTUNITIES,
4:00-5:00 p.m.
Auditorium, Xavier University Pharmacy Building

Chairman: Oscar A. Bouise, Ph.D., Pre-Medical, Allied Health and Graduate Adviser, Xavier University

4:00 p.m. D.1: PROFESSIONAL OPPORTUNITIES FOR PRE-MEDICAL STUDENTS. A. Cherrie Epps, Ph.D., Director, Medical Education Reinforcement and Enrichment Program, Tulane University School of Medicine.

4:30 p.m. D.2: GRADUATE OPPORTUNITIES FOR BIOMEDICAL STUDENTS. Hulen B. Williams, Ph.D., Dean of the College of Chemistry and Physics, Louisiana State University.

DISCUSSIONS ON RESEARCH SUPPORT OPPORTUNITIES,
4:00-5:00 p.m.
Room 203, Xavier University Pharmacy Building

Chairman: John F. Christman, Ph.D., Vice President for Research, Loyola University

4:00 p.m. D.3: OPPORTUNITIES FOR RESEARCH SUPPORT IN MINORITY INSTITUTIONS. James W. Mayo, Ph.D., Program Director, COSIP-D, National Science Foundation.

4:30 p.m. D.4: ORGANIZATIONAL STRUCTURE AND BIOMEDICAL SUPPORT FUNCTIONS OF THE NATIONAL INSTITUTES OF HEALTH. George Mirron Willis, Ph.D., Program Director, General Research Support Branch, Division of Research Resources, National Institutes of Health.

DEMONSTRATION OF BIOMEDICAL COMPUTER UTILIZATION,
5:00-7:00 p.m.

Xavier University Computer Center
Sr. Patricia Marshall, S.B. S., Director

TUESDAY, April 10, 1973

REGISTRATION, 8:30-10:30 a.m.
Lobby, Xavier University Pharmacy Building

GENERAL SESSION I, 9:00-12:30 a.m.
Auditorium, Xavier University Pharmacy Building

Chairman: Patricio Meneses, Ph.D., Catholic University
of Puerto Rico

9:00 a.m. G.4: HYDROXYLATION IN THE HUMAN BODY TO
PRODUCE CRUCIAL HARMONES AND VITAMINS, AND
DUPLICATION OF THIS PROCESS BY FLASK
MICROBIOLOGICAL TRANSFORMATION. Percy L.
Julian, Ph.D., Julian Research Institute.

10:00 a.m. COFFEE BREAK
Lobby, Xavier University Pharmacy Building

10:30 a.m. G.5: CANCER BIOCHEMISTRY: CURRENT STUDIES ON
THE REGULATION OF CELL DIVISION BY CYCLIC
AMP. Edgar E. Smith, Ph.D., Boston University School of
Medicine.

11:30 a.m. G.6: RECENT DEVELOPMENTS IN ALCOHOL
DEPENDENCE. Fred W. Ellis, M.D., Ph.D., University of
North Carolina Medical Center

LUNCHEON, 12:30-1:30 p.m.
Rush Room, Xavier University Student Center

BIOCHEMISTRY: SESSION II, 1:30-3:15 p.m.
Auditorium, Xavier University Pharmacy Building

Chairman: Donald F. Taylor, Sr., Ph.D., Cheyney State College

- 1:30 p.m. BC.7: HYPOGLYCEMIC FACTOR FROM INVERTEBRATES (*DROSOPHILA MELANOGASTER*) PRELIMINARY REPORT. Patricio Meneses, Catholic University of Puerto Rico.
- 1:45 p.m. BC.8: CHEMICAL CARCINOGEN INDUCED SYNTHESIS OF MICROSOMAL HYDROXYLASE: ITS RELATIONSHIP TO THE METABOLISM OF ENVIRONMENTAL TOXINS. Lawrence Alfred, Federal City College.
- 2:00 p.m. BC.9: REGULATION OF GLUTAMATE DEHYDROGENASE ACTIVITY IN MITOCHONDRIA BY NUCLEOTIDES AND STEROIDS. D. S. Wong, Texas Southern University.
- 2:15 p.m. BC.10: HEAT INACTIVATION OF ALKALINE PHOSPHATASE IN MOUSE LYMPHOMA AND FETAL TISSUES. Verlie A. Tisdale, Atlanta University.
- 2:30 p.m. BC.11: THE RESOLUTION AND ESTIMATION OF RNA BY THIN LAYER CHROMATOGRAPHY AND SPECTRAL ANALYSIS. Bobby Burkes, Xavier University.
- 2:45 p.m. BC.12: PROCEDURES USED IN THE STUDY OF THE EFFECTS OF THE METABOLISM OF 3,4-BENZO(A)PYRENE (BaP) BY DEVELOPING HAMSTER EMBRYONIC TISSUES. Walter Cromer, Federal City College.
- 3:00 p.m. BC.13: THE ISOLATION OF CLOSTRIDIOPEPTIDASE A FROM *CLOSTRIDIUM HISTOLYTICUM* FILTRATES. Gerard Johnson, Xavier University.

BIOLOGY: SESSION II, 1:30-3:15 p.m.

Room 203, Xavier University Pharmacy Building

Chairman: John J. Sessions, Ph.D., Texas Southern University

- 1:30 p.m. B.7: DEVELOPMENT OF A METHOD TO TEST LAMINATED MATERIAL AS MICROBIAL BARRIER. Sandra L. Neely, Bennett College.
- 2:45 p.m. B.8: THE RESPONSE OF SPINAL CORD NEUROGLIA TO PERIPHERAL NERVE INJURY. Cheh S. Lu, Paine College.

- 2:00 p.m. B.9: PRELIMINARY EXPERIMENTS ON THE EFFECTS OF COFFEE EXTRACTS ON *PARAMECIUM CAUDATUM*. Melba J. Murphy, Elizabeth City State University.
- 2:15 p.m. B.10: A COMPARATIVE ELECTROPHORETIC STUDY OF NORMAL AND LEUKEMIC TISSUES. Rachael Allen Floyd, Atlanta University.
- 2:30 p.m. B.11: CELL POPULATION CHANGES IN PERIPHERAL BLOOD DURING THE PROCESS OF LEUKEMOGENESIS IN THE LABORATORY MOUSE, C₅₇B1/6j. Brenda P. Reedy, Texas Southern University.
- 2:45 p.m. B.12: PROBLEMS IN THE MEASUREMENT OF TYROSINASE AND PEROXIDASE ACTIVITY FOLLOWING HOMOGRAFTING, Charles Marshall, Central State University.
- 3:00 p.m. B.13: CORRELATION OF CHANGES IN THE PIGMENTARY SYSTEM WITH EVENTS FOLLOWING HOMOGRAFTING. Jacques Lapeyrolerie, Central State University.

CHEMISTRY: SESSION II, 1:30-3:15 p.m.
Room 204, Xavier University Pharmacy Building

Chairman: Talaat I. Rihan, Ph.D.,
Rust college

- 1:30 p.m. C.7: THE INTERACTION OF CARBON MONOXILE WITH HEMOGLOBIN. Peter Politzer, Louisiana State University in New Orleans.
- 1:45 p.m. C.8: HYDROGEN BONDING STUDIES WITH THE ARCANA MO PROGRAM. L. Chopin Cusachs, Loyola University.
- 2:00 p.m. C.9: A THEORETICAL STUDY OF THE BARRIERS TO ROTATION IN H₂S₂, H₂Se₂ and H₂Te₂. W. L. Thornsberry, Freeport Sulphur Co.
- 2:15 p.m. C.10: LOW TEMPERATURE MAGNETIC PROPERTIES OF OXYGENATED CRYSTALLINE HUMAN HEMOGLOBIN. Larry P. Thompson, Howard University.

- 2:30 p.m. C.11: THE RAPID REMOVAL OF TOXIC METAL IONS FROM INDUSTRIAL WASTE WATER BY EXTRACTION. Curtis W. McDonald, Southern University.
- 2:45 p.m. C.12: A COMPARISON OF SPECTROPHOTOMETRIC AND FLUORO- METRIC METHODS FOR VITAMIN B₁₂ ASSAY AFTER RESOLUTION BY GEL CHROMATOGRAPHY. S. Tobias, Dillard University.
- 3:00 p.m. C.13: THE CRYSTAL AND MOLECULAR STRUCTURE OF 2-METHOXYPHENOTHIAZINE. Coleridge Franklin, Xavier University.

PHARMACOLOGY: SESSION I, 1:30-3:15 p.m.
Room 301, Xavier University Pharmacy Building

- Chairman: Vernon B. Haarstad, Ph.D.,
Tulane University School of Medicine
- 1:30 p.m. P.1: IN VIVO STUDIES ON THE MYOMETRIAL MOTILITY OF DOGS. G. A. Chibuzo, Tuskegee Institute.
- 1:45 p.m. P.2: DNA AS A COMMON DENOMINATOR FOR ENZYMES AND DRUG SENSITIVITIES IN CANCER OF THE COLON. M. L. Guillory, L. S. U. Medical Center.
- 2:00 p.m. P.3: A STUDY OF THE EFFECT OF SHAKING STRESS ON DIPHENYLDANTOIN PROTECTION USING ELECTROSHOCK IN MICE. Jennifer C. Allen, Xavier University.
- 2:15 p.m. P.4: THE SYNTHESIS AND PHARMACOLOGY OF SOME S T A B L E A N A L O G S O F ACETYLSECOHEMICHOLINIUM-3. Arvind B. Rege, Tulane University School of Medicine.
- 2:30 p.m. P.5: INTERACTION BETWEEN PENTOBARBITAL AND CORTISOL WITH REGARD TO THE INDUCTION OF TRYPTOPHAN PYRROLASE IN MOUSE AND RAT LIVERS. I. S. Thandi, Texas Southern University.
- 2:45 p.m. P.6: PHARMACOLOGICAL ACTIVITY OF MYCOXIN FROM ASPERGILLUS SPECIES ISOLATED FROM HOUSTON SOIL. Kenneth Sam, Texas Southern University.

3:00 p.m. P.7: THE EFFECT OF NUMBER AND PROPORTION OF REINFORCEMENTS ON THREE MEASURES OF RESISTANCE TO EXTINCTION. Ralph M. Chinn, Clark College.

BIOLOGY: SESSION III, 3:30-4:30 p.m.

Room 203, Xavier University Pharmacy Building

Chairman: Virgil Whitehurst, Ph.D.,
Howard University

3:30 p.m. B.14: ARTERIAL PRESSURE FOLLOWING CANINE KIDNEY PRESERVATION. Kenneth Sam, Texas Southern University, Houston, Texas.

3:45 p.m. B.15: CARDIOVASCULAR ALTERATIONS IN INTACT AND SPLENECTOMIZED DOGS DURING ACUTE OLIGEMIC SHOCK. Frieda M. Thornton, Central State University.

4:00 p.m. B.16: THE CLINICAL MANIFESTATIONS, COMPLICATIONS, AND MORTALITY OF ACUTE MYOCARDIAL INFARCTION IN A BLACK POPULATION. Monica C. Greene, Howard University.

4:15 p.m. B.17: UTILIZATION OF THE G-BANDING PATTERN TECHNIQUE IN A DARYOTYPIC STUDY OF LEUKEMOGENESIS. Sandra A. Murray, Texas Southern University.

CHEMISTRY: SESSION III, 3:30-4:30 p.m.

Room 204, Xavier University Pharmacy Building

Chairman: Leonard Price, Ph.D.,
Xavier University

3:30 p.m. C.14: THE SYNTHESIS OF DIBENZOCYCLOHEPTENONYL PIPERAZINE DERIVATIVES. J. H. Sayles, Bennett College.

3:45 p.m. C.15: CHLORINE OXIDATION OF METHYLTHIOPYRIDAZINES. Wilbert L. Williams, Xavier University.

- 4:00 p.m. C.16: LEWIS ACID CATALYZED REACTIONS. S. Munavalli, Livingstone College
- 4:15 p.m. C.17: THE PREPARATION AND REACTIONS OF A "NEW" PORPHYRIN. Sandra F. Squirewell, North Carolina State College.
- 4:30 p.m. C.18: COMPLEXES OF GOLD (I) COMPOUNDS AND TETRAZOLES. Charles Winfrey, Xavier University.

MEDICAL TECHNOLOGY: SESSION I, 3:30-4:15 p.m.
Auditorium, Xavier University Pharmacy Building

Chairman: Joan A. Broekhoven, U. S. Public Health Service Hospital

- 3:30 p.m. MT.1: HEMOGLOBIN ELECTROPHORESIS AS A MASS SCREENING METHOD FOR DETECTION OF HEMOGLOBINOPATHIES. Mahendra Singh, Southern University.
- 3:45 p.m. MT.2: RADIOMETRIC METHOD FOR ANTIBIOTIC SUSCEPTIBILITY TESTING SUBSEQUENT TO DETECTION OF BACTERIURIA. Gwendolyn Johnson, Bennett College.
- 4:00 p.m. MT.3: FLUORESCENT-DYE PENETRATION FOR THE DETECTION OF EARLY SIGNS OF DENTAL CARIES. H. Ralph Rawls, Gulf South Research Institute.

SIMULATION AND INSTRUMENTATION: SESSION I, 3:30-4:30 p.m.
Room 301, Xavier University Pharmacy Building

Chairman: Sr. Patricia Marshall, S.B.S.,
Xavier University

3:30 p.m. S.1: AN ELECTRONIC DATA ACQUISITION SYSTEM FOR BIOMEDICAL RESEARCH. Darryl M. Washington, North Carolina A&T University.

3:45 p.m. S.2: THE CELL: AN ELECTRICAL MODEL, Raymond S. Lieber, United States Air Force.

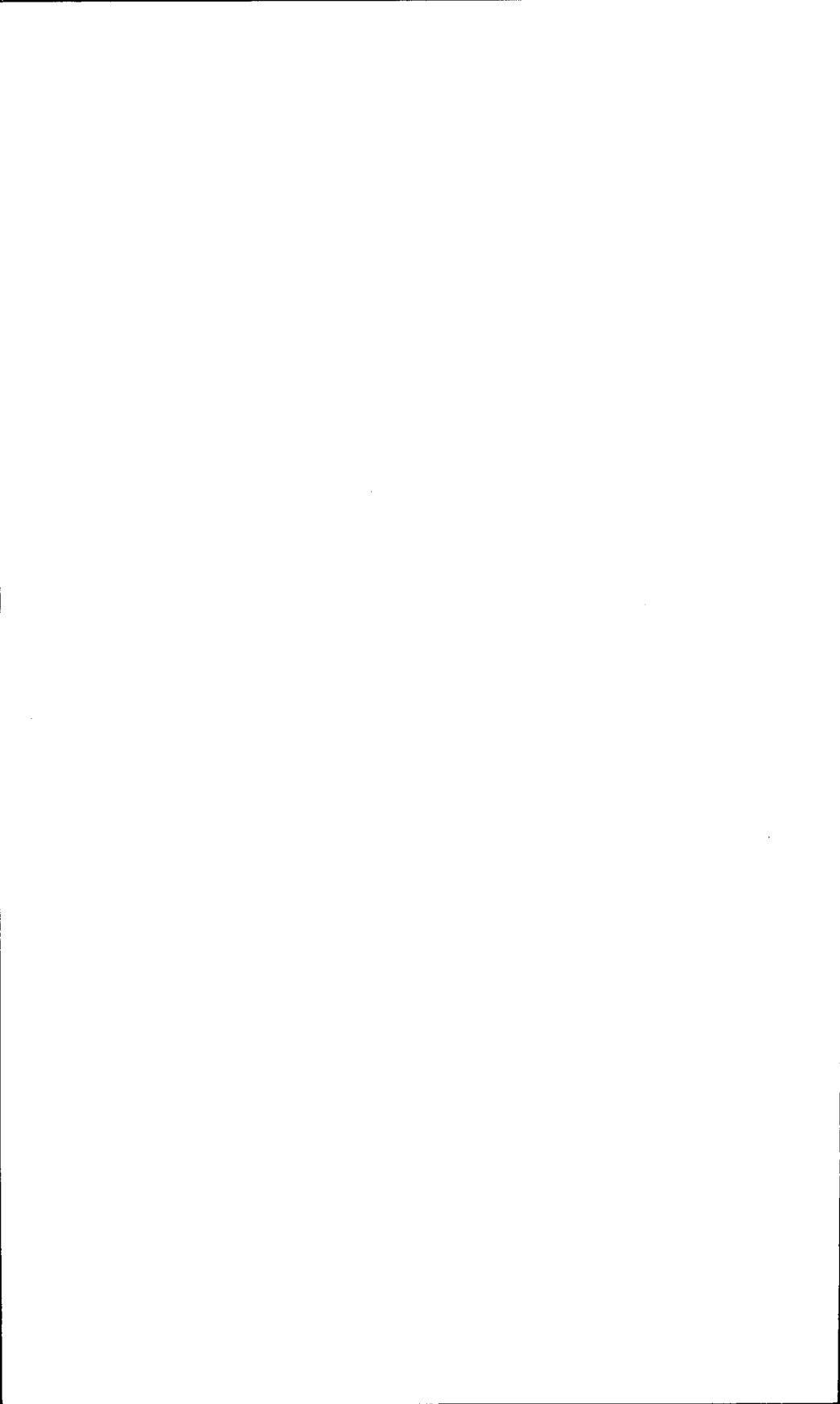
4:00 p.m. S.3: A COMPUTER SIMULATION OF IRRADIATION OF THE MOUSE THYMUS. Judith Rae Lumb, Atlanta University.

4:15 p.m. S.4: SYSTEMS ANALYSIS AND THE RESEARCH COMPUTER PROGRAM. James L. Schmit, Department of Computer Science, Loyola University.

ABSTRACTS

of papers presented at the

FIRST ANNUAL XAVIER-MSBS BIOMEDICAL SYMPOSIUM



GENERAL SESSIONS

G.1: A REVIEW OF SELECTED ASPECTS OF SICKLE CELL DISEASE. *W. Delano Meriwether, M.D.*, Thorndike Memorial Laboratory, Harvard Medical Unit, Boston City Hospital, Boston, Massachusetts 02118.

New medical and scientific developments are occurring in the area of sickle cell disease at a dizzying pace. For example, the first two years of this decade have seen the clinical use of urea come and go. Still, the story of the biochemical behavior and properties of sickle hemoglobin and its interaction with various chemical agents continues to unfold. Advanced scientific knowledge regarding the molecular interaction of sickle hemoglobin and its ultimate formation of tactoids composed of rod-like structures during deoxygenation make for interesting discussion. The current review of knowledge about various aspects of sickle hemoglobin, its structure, its interaction with fetal hemoglobin and with 2,3-diphosphoglycerate, its behavior under varying conditions of temperature, and pH, and finally, the anti-sickling effects of chemical agents such as cyanate and carbamyl phosphate all help provide a rational basis for the current molecular attack on sickle cell disease.

G.2: STUDIES IN GENOMIC DEREPRESSION - NORMAL AND NEOPLASTIC. *Merle Mizell, Ph.D.*, Laboratory of Tumor Cell Biology, Tulane University, New Orleans, La. 70118.

The fertilized egg is programmed to develop into a single organism. The process by which a single cell differentiates into the multicellular vertebrate organism such as a frog or a man has been described, but the mechanism still remains an enigma. The *mechanism* of cellular differentiation, both normal and neoplastic, has yet to be understood: we have yet to learn how cells express the vast amount of information they contain within their genetic apparatus.

A muscle cell has the same number and types of chromosomes as a nerve cell or kidney cell. Furthermore, current knowledge indicates that all somatic cells, regardless of their specialization, possess *all* the genetic information to form *all* cell types. It is thought, however, that a muscle cell, in becoming a muscle cell, utilizes only a small fraction of its information, perhaps merely 5%; the remaining 95% of its information and abilities lie dormant and unused. Thus, the relatively large amount of *unused* information represents a potential capacity to produce the other cell types of the body.

We shall discuss some of our recent studies of induced limb regeneration in mammals and our viral carcinogenesis studies and in both of these investigations the phenomenon of latency - or the existence of genetic information in a repressed state - has evolved as a major theoretical consideration. In our studies of the frog kidney tumor, we have found evidence that low temperature treatment of the "virus-free" tumor cells results in the appearance and replication of its herpes virus, or, stated another way, that low temperature results in activation of a viral genome which exists in a latent state in the "virus-free" form of the tumor.

The dedifferentiation and re-differentiation of cells within a regenerating limb are processes consistent with current theories of gene activation - gene repression. The altered expression of genetic information in these cells, the activation of information once repressed or latent, is the theoretical basis of equivalence between our laboratory's two major areas of research. The significance of this theme shall be discussed.

G.3: ENZYME STRUCTURE-FUNCTION RELATIONSHIPS: THE ROLE OF *ESCHERICHIA COLI* P-ENOLPYRUVATE CARBOXYLASE IN THE REGULATION OF THE CITRIC ACID CYCLE. *Thomas E. Smith*, Ph.D., Bio-Medical Division, Lawrence Livermore Laboratory, University of California, Livermore, California 94550.

The tricarboxylic acid (TCA) cycle serves a dual role in *E. coli* metabolism: it provides most of the energy and many of the intermediary metabolites necessary for growth. If there were no thermodynamically favored mechanisms available for getting intermediates into the TCA cycle, the growth demands of the cells would soon deplete the cycle of metabolites and the cells would no longer grow and divide. A major physiological role of P-enolpyruvate carboxylase in *E. coli* is to catalyze a thermodynamically favored reaction for the synthesis of oxaloacetic acid (OAA), one of the substrates for the first reaction of the TCA cycle.

This enzyme is an allosteric protein of 400,000 molecular weight and is composed of four subunits of identical size. Electron microscopy, performed in the presence of an appropriate negative stain, indicates that the subunits are arranged in tetrahedral symmetry.

The activity of the enzyme is regulated by several intermediary metabolites. It is stimulated by acetyl-coenzyme A, the second substrate for the first reaction of the TCA cycle, and it is strongly inhibited by aspartic acid, the transamination product of OAA. Kinetic analyses indicate that these two modifiers of catalytic activity function by changing the affinity of the enzyme for the substrate P-enolpyruvate. The enzyme is also activated by some organic solvents, presumably by inducing a conformation change in the protein similar to that produced by acetyl-coenzyme A. The ability of

aspartic acid to inhibit catalytic activity is not changed appreciably in the presence of ethanol. Kinetic analyses indicate that the maximum catalytic activity possible by ethanol activation is theoretically the same as that apparent by acetyl-coenzyme A activation. The mechanism of activation differs.

The importance of this enzyme in *E. coli* metabolism is demonstrated by the fact that mutants devoid of this catalytic activity fail to grow on glucose as the single carbon source. These mutants produce a protein that is immunologically similar to the native wild type enzyme. The availability of these mutants offers an additional means to study the structure-function relationships required for the catalytic activity and the allosteric regulation of this enzyme.

Supported by U.S. Atomic Energy Commission.

G.4: HYDROXYLATION IN THE HUMAN BODY TO PRODUCE CRUCIAL HARMONES AND VITAMINS, AND DUPLICATION OF THIS PROCESS BY FLASK MICROBIOLOGICAL TRANSFORMATION. Percy L. Julian, Ph.D., Julian Research Institute, Franklin Park, Ill. 60131

The chemical role of water in plant and animal bodies has played a peculiarly significant part in the course of my scientific career. Quite accidentally, the hydration of a chemical compound, found in the recesses of the Calabar bean oil, ended in my first isolation in my laboratory, again quite accidentally, of a sterol from which I later was able to synthesize the female hormone, Progesterone. Later in life, the hydroxylation of the then-called Compound "S" (now called Cortisolone) — occurring in the adrenal glands, and which steroid I had synthesized from soybean sterols — led to the preparation of Hydrocortisone and Cortisone. Today, this type of Hydroxylation represents the path from Cortisolone to all members of the Cortisone family of drugs. Probably the most outstanding investigation in our laboratory at present is represented by another Hydroxylation which the kidneys perform, namely, the Hydroxylation of Vitamin D into 25-Hydroxy-Vitamin D, a derived Vitamin D much more potent than the normal Vitamin D. Thus, the OH, or hydroxyl group, as we call it, of water plays a most significant part in the synthesis of very important ingredients in the human and animal organisms. Why? We believe it is because these substances containing the OH-group of water are more likely to be transported by the aqueous fluids of the body into the blood stream, and into the various tissues of the human body. These and other transformations via Hydroxylation will be discussed and their significance described. They are dear transformations to me because they represent some of the personal romance in my own scientific investigations.

G.5: CANCER BIOCHEMISTRY: CURRENT STUDIES ON THE REGULATION OF CELL DIVISION BY CYCLIC AMP. *Edgar E. Smith*, Ph.D., Assistant Dean for Minority Affairs, Boston University School of Medicine, Boston, Massachusetts 02118.

Adenosine 3',5' -monophosphate (Cyclic AMP) and its butyryl derivatives have been shown quite clearly to affect the growth and morphology of certain neoplastic and virus transformed cells, primarily fibroblasts. Our studies on human cancer cells of epithelial origin led us to examine the effect of cyclic AMP on the tumorigenicity of cells cultivated from an epidermoid carcinoma of the floor of the mouth (Strain KB).

Control cells were grown in Eagles basal medium (with Earle's salts), supplemented with 10% fetal calf serum, 200 mM L-glutamine, adjusted to pH 7.4 with sodium bicarbonate. Treated cells were grown in identical medium to which cyclic AMP had been added to a final concentration of 1 mM. The experiment was begun while the cells were in the log phase of growth and continued for 5 days, with one change of medium on day 3.

To test tumorigenicity, cells were harvested, resuspended in control medium, and injected into the cheek pouches of six to eight week old Syrian hamsters. 10,000 treated or control KB cells were implanted under the epithelium of both cheek pouches of 6 animals with a 24 gauge needle. These were observed weekly under light anesthesia for 70 days. All 3 animals receiving control KB cells developed solid tumors (4 of 6 pouches), whereas no tumors were observed in the cheek pouches of the 3 animals (6 pouches) implanted with cyclic AMP treated cells.

These results clearly demonstrate that under the conditions employed cyclic AMP was capable of abolishing the tumorigenicity of the human cancer cells studied. Possible mechanisms of this action together with observed effects of cyclic AMP on morphology and growth rate will be discussed.

G.6: RECENT DEVELOPMENTS IN ALCOHOL DEPENDENCE, *Fred W. Ellis* and James R. Pick, Department of Pharmacology, School of Medicine, University of North Carolina, Chapel Hill, North Carolina 27514.

The induction of physiological or physical dependence on alcohol (ethanol) is a relatively new concept about an old drug. A long-standing association of D.T.'s (delirium tremens) with excessive and prolonged ingestion of alcoholic beverages until relatively recently was generally considered to be a reflection of an unexplained complication of alcohol intoxication or a nutritional deficiency. During the past two decades the classic clinical observations of Victor and Adams (Res. Publ. Ass. Res. Nerv.

Ment. Dis., 32, 526-573, 1953), together with the human experimental studies of Isbell, et al. (Quart. J. Stud. Alc., 16, 1-33, 1955) and Mendelson and coworkers (Quart. J. Stud. Alc., Suppl. 2, 1964) have been primarily responsible for establishing the presently-held view that alcohol is a major dependence-producing drug in man.

For a number of years many attempts have been made to entice *voluntary* alcohol consumption of sufficient magnitude in various animal species to induce dependence on ethanol. This approach in general has been unsuccessful. Lacking such animal models of ethanol dependence research in the area of its etiology, mechanisms, and prevention has been hindered. Within the past 4 to 5 years a rather sudden new development in this research effort emerged from several labs in which ethanol intake is *forced* upon animals through intragastric, liquid diet, and inhalation administrations.

In our laboratory the technique of forced heavy ethanol administration by intragastric intubation has been employed to develop animal models of ethanol dependence in rhesus monkeys and beagle dogs (Ellis and Pick, Pharmacologist, 11, 256 (August), 1969; Fed. Proc. 29, 649 (March-April), 1970a; J.P.E.T., 175, 88-93, 1970b; Fed. Proc., 30, 568 (March-April), 1971).

As indicated by withdrawal reactions, dependence develops within about two weeks in monkeys and 3 to 4 weeks in dogs. The withdrawal syndrome is characteristically an emerging sequence of increasing hyperexcitability and altered behavioral patterns which progress with increasing severity through tremulous, spastic and convulsive stages. The heavy ethanol doses which induce this dependent state also induce an accelerated rate of ethanol metabolism which reaches levels about 50% greater than control values.

Studies in dogs indicate that dose- and time-dependent or dose-response relationships exist among 3 doses of ethanol and the induction of dependence. Animals receiving one-third of the rapid dependence-inducing dose develop only very mild withdrawal reactions even after more than 2 years of intake.

Currently, a wide variety of physiological, metabolic and biochemical parameters are under study in these animal models. In some of these experiments preliminary data suggest that during several weeks of chronic intoxication and the associated withdrawal periods mild decrements develop in serum calcium and total proteins levels. Concomitantly marked rises occur in serum concentrations of cholesterol and triglycerides. Such changes thus far observed only serve at present to demonstrate and define altered biochemical states during ethanol intoxication and dependence and do not indicate what roles, if any, they play in the mechanisms of dependence induction.

DISCUSSION SESSIONS

D.1: PROFESSIONAL OPPORTUNITIES FOR PRE-MEDICAL STUDENTS. *Anna Cherrie Epps, Ph.D.,* Director, Medical Education Reinforcement and Enrichment Program, Tulane University School of Medicine, New Orleans, La. 70112.

Allied health, graduate, medical and dental career opportunities and sources of financial aid for pre-medical students will be discussed.

D.2: GRADUATE OPPORTUNITIES FOR BIOMEDICAL STUDENTS, *Hulen B. Williams,* Dean, College of Chemistry and Physics, Louisiana State University, Baton Rouge, Louisiana 70803.

Several topics which should be of interest to biomedical students including the question, "Who is a biomedical student?", will be discussed. The nature of graduate study as opposed to professional study and continuing education will be mentioned. We will explore what, for many, may be called the graduate school dilemma—go or no-go—who needs graduate school? What do you want your role in life to be—a purveyor of knowledge, a producer of knowledge or a practitioner of knowledge? Your careers probably cannot be limited to just one or even two of these—the recipe for our post-baccalaureate study must include some of all—but in what proportion? Each must ask himself, "Do I seek a program of advanced study that will emphasize teaching, research or technology?" This problem is solved by answering three questions: (1) What are my abilities? (2) What is my dedication? (3) Which is most fun? Questions undergraduate students ought to ask about graduate school will be raised, and some of them answered, including, "How do I get to graduate school from where I am?"

D.3: OPPORTUNITIES FOR RESEARCH SUPPORT IN MINORITY INSTITUTIONS. *James W. Mayo, Ph.D.,* Program Director, College Science Improvement Program-D, Division of Undergraduate Education, National Science Foundation, Washington, D.C. 20550

Opportunities for support for research in predominately undergraduate institutions will be reviewed. There are presently two programs of the National Science Foundation devoted to research support: the Basic Scientific Research Support Program and the Research Initiation Grant program. In addition, institutional research support activities and cooperative research support activities offer potentials for research support. These elements of the foundation and their coordination will be discussed.

D.4: ORGANIZATIONAL STRUCTURE AND BIOMEDICAL SUPPORT FUNCTIONS OF THE NATIONAL INSTITUTES OF HEALTH. *George Mirron Willis*, Ph.D., Program Director, General Research Support Branch, Division of Research Resources, National Institutes of Health, Bethesda, Maryland 20014.

This presentation will include (1) an overview of the organization and mission of the National Institutes of Health, the major research supporting agency of the Department of Health, Education, and Welfare; (2) a description of biomedical research support mechanisms and the research grant review process; (3) specific programs for support of minority institutions and ways in which they may benefit black and other minority students; and (4) an assessment of the extent to which minorities have participated and benefited from NIH programs.

D.5: SCIENCE CAN BE FUN IF TAUGHT WITH PARABLES. *Benjamin H. Alexander*, Ph.D., Assistant Chief, General Research Support Branch, Division of Research Resources, National Institutes of Health, Bethesda, Maryland 20014.

Science is truly beautiful and interesting when the teacher comes in prepared. Some difficult chemical reactions can be made simple and easy to recall by equating chemistry to human beings.

BIOLOGY SESSIONS

B.1: EFFECTS OF INTRAUTERINE DEVICE (IUD) ON OVARIAN SECRETION OF PROGESTAGENS AND OESTROGENS IN PREGNANT RATS, *D.S.M. Prasad*, Division of Natural Sciences and Mathematics, Barber-Scotia College, Concord, N. C. 28205; *H. S. Joshi and A. P. Labhsetwar*, Worcester Foundation for Experimental Biology, Shrewsbury, Mass.

The present study investigated the ovarian secretion of progesterone and oestrogens in pregnant rats. Adult female rats with Intrauterine Device (IUD) in one horn were mated to normal rats and the ovarian venous blood collection was made on the 4th day of pregnancy between 10.00 and 16.00 hr. Progesterone, 20α -dihydroprogesterone, estrone and estradiol measurements were made in ovarian venous blood plasma by radioimmunoassay. Separation of the steroids was carried out by subjecting the plasma extract to partition on celite columns.

The results obtained show that both the concentration and the output of progesterone were significantly ($P < 0.001$) lower on the IUD side than on the opposite side, although the ovarian blood flow rates on either side are comparable. The ratio of progesterone to 20α -dihydroprogesterone was also significantly lower on the IUD side. Our results provide evidence that IUD in rats markedly affects the steroid secretion from the adjacent ovary which may account at least partly for the local antifertility effects of the device in rats.

B.2: EFFECTS OF THE FOLLICLE-STIMULATING HORMONE ON ENZYME ACTIVITY IN THE SERTOLI CELLS OF THE MOUSE TESTIS. *Eugene Johnson*, Department of Biology, Johnson C. Smith University, Charlotte, North Carolina 28216.

The seminiferous tubules of the mature mouse testis contain developing sperm, spermatogonia, and Sertoli cells. These supporting cells differentiate during the first wave of spermatogenesis and provide nutrients for the maturing spermatids. The Sertoli cells are visualized histochemically by their lactate and malate dehydrogenase activities and by their cytochrome oxidase and acid phosphatase activities. Lipids and glycogen-like materials can also be localized in these cells. The cells are thought to secrete steroids under certain conditions, but no evidence for 3 β -hydroxysteroid dehydrogenase, an enzyme essential for steroidogenesis, was obtained.

BALB/c Jax mice were treated daily beginning at six days postpartum

with 0.135 U follicle-stimulating hormone/gram body weight and enzyme activities in the Sertoli cells were observed at intervals during the first wave of spermatogenesis. Altered patterns of enzyme activities and lipid accumulations during spermiogenesis suggest that the Sertoli cells may provide a mechanism for the regulation of sperm maturation in the mouse by the follicle-stimulating hormone.

Supported by Public Health Service grant 5 S06 RR 08022, MSBS.

B.3: PRELIMINARY OBSERVATIONS OF SOME DIURNAL CHANGES IN RATS, *Rebecca Chaisson*, Clyde Varner, and Portia U. Ashman, Department of Biology, Xavier University, New Orleans, La. 70125.

Diurnal changes in liver glycogen, liver protein, liver and stomach weights were demonstrated in the partially inbred Holtzman rat when the animals were maintained under 12 hours of alternating artificial illumination. The peak glycogen level and peak liver weights were exactly in phase demonstrating that when glycogen is deposited in the liver, the liver is at its peak weight. The peak in stomach weights occurred 4 hours before the glycogen and liver weight peaks suggesting a lag between the time food was ingested and the time glycogen was deposited in the liver. The partially inbred Holtzman rat proved to be an ideal animal for the study of diurnal changes.

Supported by NIH Grant Number 1S06RR08008-01.

B.4: THE EFFECT OF DORSAL AXIAL ORGANS ON THE MIGRATION OF PRIMORDIAL GERM CELLS IN *XENOPUS*. *F. A. Taylor* and *A. W. Blackler*, Southern University, Baton Rouge, La. 70813 and Cornell University, Ithaca, N.Y. 14850.

Dorsal axial organs of *Xenopus laevis laevis* (Daudin) embryos were tested for their ability to attract primordial germ cells (PGC) to the genital ridge. The dorsal axial organs of late neurulae were excised and grafted mid-ventrally to other neurulae. Young larvae were fixed with Rossmans' fixative at Nieuwkoop and Faber stage 47. Standard paraffin embedding technique was used, and serial sections at 5 μ . were made. Periodic acid Schiffs' (PAS) reagent was used with hematoxylin as a counterstain. Primordial germ cells were characterized as being large cells containing yolk platelets, glycogen granules, and a lobe-shaped nucleus. They were found in the genital ridges and dorsal mesentery of both host and graft embryos, as well as such aberrant sites as the gut epithelium and even the notochord. The ability of the dorsal organs to attract germ cells varied in an anterior-posterior direction, with grafts from the mid-trunk region being

most effective, probably due to their ability to induce the formation of a dorsal mesentery. Grafts taken from the anterior regions of the trunk were least effective in attracting germ cells and produced the greatest number of aberrant cells. Considerations of possible mechanisms of germ cell migration and the mode of action of the dorsal organs led to the conclusion that the combined effects of an attracting substance emanating from the dorsal organs, the "funneling effect" of a properly forming dorsal mesentery, and "trapping action" in the appropriate tissues, i.e., the coelomic epithelium of the genital ridge, account for the displacement of PGC from the deep endoderm to the site of the future gonad.

Supported by NIH Pre-Doctoral Grant Number 5 GM-01035-08-01.

B.5: LIFE CYCLE OF *BRACHYLAIMUS MICROTI*, A PANCREATIC AND LIVER PARASITE (TREMATODA: BRACHYLAIMIDAE). R. A. Mendoza, A. G. Canaris, and J. R. Bristol. Department of Biological Sciences, The University of Texas at El Paso, Texas 79968.

In this life cycle the pulmonate terrestrial snail, *Oreohelix strigosa*, serves as both the first and second intermediate host. *Peromyscus maniculatus* serves as the natural definitive host and the Golden Hamster, *Gerbillus gerbillus*, as an experimental host. After establishment in the definitive host, the adult trematode will oviposit in 14-21 days. Eggs voided with feces are ingested by snails. Ingested eggs hatch in the snail's stomach and penetrate the digestive gland. The germinal cells within the miracidia give rise to sporocysts which mature into a hollow tubelike structure. Germinal cells from the wall of the sporocyst differentiate as cercariae. Mature cercariae are shed on the ground. Cercariae enter another snail via the pneumostome and migrate up the ureter to the snail's kidney where they then continue to grow and differentiate into an unencysted metacercaria. When the snail is eaten by the definitive host, the metacercariae are released from the kidney and migrate to the pancreas and/or liver where they mature to adults.

B.6: INTRASPECIFIC VARIATION AND HOST RECORDS OF *PHYLLODISTOMUM LACUSTRI* (LOEWEN, 1929), Frederick A. Christian, Department of Biology, Southern University, Baton Rouge, Louisiana 70813.

Specimens of *Phyllodistomum lacustri* have been taken from the urinary bladders of the following catfishes, *Noturus flavus*, *Noturus miurus*, *Ictalurus punctatus*, *Ictalurus nebulosus*, *Ictalurus furcatus*, and *Ictalurus*

platycephalus in Ohio and the latter four in Louisiana. Specimens from each fish host species exhibit many morphological variations in size, shape and arrangement of the reproductive structures. These variations tend to depend on the sex, age, and reproductive activities of the trematode specimens of *Phyllodistomum lacustri*. Previously undescribed features include the presence or absence of pharyngeal glands.

B.7: DEVELOPMENT OF METHOD TO TEST LAMINATED MATERIAL AS MICROBIAL BARRIER, Sandra L. Neely and L. S. Gall, Department of Biology, Bennett College, Greensboro, N. C. 27420.

Claims have been made that certain disposable and reusable materials used in surgical drapes or surgeon's gowns provide a microbial barrier. Tests designed to support these statements did not seem to be entirely satisfactory for our project. Several alternate procedures were therefore developed and evaluated. One technique, designated the inverted test tube, was performed by placing one inch squares of the test material over the mouth of a screw cap test tube containing one inch (4ml) 10^6 suspension *Staphylococcus aureus* and *Escherichia coli*. The cap was screwed in place and the test tube inverted. Samples were taken at 0, 2, and 4 hours by pressing a sterile disc against the outer surface of the material and then placed in contact with a nutrient agar plate. A second method, designated as the dry test, was performed by placing a one inch square of the test material on a fully grown lawn of *S. aureus* or *E. coli*. At 0, 2, and 4 hours a sterile disc was pressed against the outer surface of the material and then placed in contact with a nutrient agar plate. The third procedure, designated the disc test, was performed by placing a one inch square of the test material over a small circular well containing nutrient agar. One drop of 10^6 culture of *S. aureus* or *E. coli* was placed on the cloth over the well and a standard pressure plunger was placed over the drop and depressed so that the cloth touch the agar evenly. Results of each of these test procedures will be presented and discussed.

B.8: THE RESPONSE OF SPINAL CORD NEUROGLIA TO PERIPHERAL NERVE INJURY, Cheh S. Lu, Department of Biology, Paine College, Augusta, Georgia 30901.

There is some controversy regarding origin of phagocytes in the central nervous system after peripheral nerve injury. Present study examines (1) proliferating cells at various intervals following injury; (2) possible invasion of hematogenous phagocytes after injury. Left sciatic nerves of 10

CBA adult mice were transected. At daily intervals up to day 5 following transection, two mice were killed by systemic perfusion of buffer 3% glutaraldehyde. Two hours before sacrifice, each mouse received H^3 -thymidine ($10 \mu\text{c}/\text{gm}$ body weight) subcutaneously. In another series, 10 CBA mice received H^3 -thymidine subcutaneously three times at 24, 20, and 16 hours before nerve transection (total amount of $250 \mu\text{c}/\text{mouse}$). Cross sectional blocks of lumbosacral cord were dehydrated and embedded in glycol methacrylate (GMA) for light microscopic autoradiography. No labeled cells were observed in right spinal grey matter (contralateral to sectioned nerve) or in sections obtained 1 day following transection. At end of days 2,3,4, and 5, labeling indices for non-neuronal grey matter cells were 3.8% 2.5%, 1% and $< 0.1\%$ respectively. Labeling cells were found in both anterior and posterior horns (day 2) and subsequently shift to posterior horn (days 3 and 4). Light microscopic nuclear morphology was quite variable and suggested that all glial cell classes were labeled. No hematogenous phagocytes were found in injured cord.

B.9: PRELIMINARY EXPERIMENTS ON THE EFFECTS OF COFFEE EXTRACTS ON *PARAMECIUM CAUDATUM*, Melba J. Murphy, Elizabeth City State University, Elizabeth City, North Carolina 27909.

Cigarette smoke and cigarette extracts have been found to affect the growth of *Paramecium caudatum*, *Neurospora crassa*, and *Staphylococcus aureus*. It has been postulated that the extract has growth stimulating effect on these test organisms. The cigarette extracts and cigarette smoke have a definite effect on the actual size of *Paramecium caudatum*. Present experiments were conducted to determine the effects of the coffee extract on *Paramecium caudatum*. Freeze dried Sanka 97% caffeine free coffee was used for the experiments. The extraction was made by soaking one gram of coffee in 100 ml of distill water. Several dilutions were prepared. In literature there are some indications that the mitochondria of the ciliated protozoan *Tetrahymena pyriformis* are affected by the cigarette smoke (Science, Vol. 168, May, 1970).

The maximum growth in my experiment was obtained in the 1:100 dilution and this was 23% greater than the control; the minimum growth was observed in the 1:1 dilutions which was 96% lower than the control on the average. It was noticed with interest that ciliary activities were retarded or inhibited in the 1:1 dilution. Further research to find out the effect of coffee extract on the mitochondria and other microcellular structures in *Paramecium caudatum* will be interesting.

B.10: A COMPARATIVE ELECTROPHORETIC STUDY OF NORMAL AND LEUKEMIC TISSUES, *Rachael A. Floyd* and *Judith R. Lumb*, Biology Department, Atlanta University, Atlanta, Ga. 30314.

The alkaline phosphatase activity of placenta, normal spleen, leukemic tissues and fetal tissue from C57Black mice was characterized by electrophoresis in the polyacrylamide gel using the high voltage pulsing system of Ortec. The azo dye stain was used with the substrate α -naphthylphosphate. The lead conversion method was used with the substrated β -glycerophosphate and sodium pyrophosphate. The p-nitrophenylphosphate was applied to the gel after the run. The α -naphthylphosphate stain showed one band for placenta and spleen, and two bands for whole embryo and lymphoma. All four tissues showed bands at the same location with β -glycerophosphate as with α -naphthylphosphate. The lead conversion stain of pyrophosphate showed the spleen and lymphoma activity to be at different sites from the α -naphthylphosphatase and β -glycerophosphatase activities. Neuraminidase had no effect on the pyrophosphatase activities or any of the alkaline phosphatase activities of whole embryo. It slowed the migration of α -naphthylphosphatase and β -glycerophosphatase activities of placenta, normal spleen, and lymphoma tissues. Alkaline phosphatase study will be helpful to the understanding of malignant transformation.

Supported by NSF Grant Number GY-10465.

B.11: CELL POPULATION CHANGES IN PERIPHERAL BLOOD DURING THE PROCESS OF LEUKEMOGENESIS IN THE LABORATORY MOUSE, C₅₇B1/6j, *Brenda P. Reedy* and *John J. Session*, Department of Biology, Texas Southern University, Houston, Texas 77004.

The injection of 120 micrograms of 7,12-dimethylbenz (alpha) anthracene (DMBA) into one-day-old C₅₇B1/6j mice gave rise to a high incidence of lymphocytic leukemia. The leukemic and preleukemic stages were characterized by cells with abnormal karyotypes in bone marrow, spleen, mesenteric lymph node and thymus. Data obtained from preliminary studies show little or no difference when the leukocyte counts of peripheral blood of the DMBA treated mouse were compared with the leukocyte counts of peripheral blood of control mice which did not receive DMBA. However, cell population changes in the peripheral blood of the DMBA treated mice were observed when differential cell counts were made. The significance of these and other data related to the process of leukemogenesis will be discussed.

NIH Grant Number PR08061-01

B.12: PROBLEMS IN THE MEASUREMENT OF TYROSINASE AND PEROXIDASE ACTIVITY FOLLOWING HOMOGRAFTING. Charles Marshall, Osric Reavis, Jacques Lapeyrolerie, Shelbert Smith, Thomas Craft, Department of Biology, Central State University, Wilberforce, Ohio 45384.

One of the most important aspects of the study of cell pigmentation is the biochemical process for the synthesis of melanin. Previous work has established that the pathway of melanin synthesis involves the oxidation of tyrosine→dopa→melanin catalyzed by tyrosinase. Furthermore, it has been reported that peroxidase may also serve as a catalyst for this synthesis in some cells. The unravelling of the steps in the pathway has been difficult because of the lack of a sensitive assay procedure for tyrosinase and peroxidase in small samples. As part of the overall study on melanogenesis and the homograft reaction, this work is an attempt to evaluate the available procedures for the determination of tyrosinase and peroxidase and to discuss the significance of the determination of tyrosinase and peroxidase in the study of the events associated with the homograft reaction with *Diemictylus viridescens*.

B.13: CORRELATION OF CHANGES IN THE PIGMENTARY SYSTEM WITH EVENTS FOLLOWING HOMOGRAFTING. Jacques Lapeyrolerie, Osric Reavis, Charles Marshall, Thomas Craft, Shelbert Smith, Department of Biology, Central State University, Wilberforce, Ohio 45384.

We have observed that epidermal melanophores increase after the vascular reaction following homografting in *Diemictylus viridescens*.

In this investigation we are determining if the amount of melanin synthesized affects the events which follow homografting. This work will include the correlation of tyrosinase and peroxidase activity with the events following homografting.

With autografts as controls, the major events which follow homografting and autografting were observed and compared. Significant differences were found between autografts and homografts with reference to the vascular reaction, ratio of dermal/epidermal melanophores and hemorrhage. Vascular stasis, cell demolition and definitive graft rejection were observed in the specimens receiving homografts, but not in the autografts.

A proposed model of some events that occur during the process of melanogenesis that may reduce the severity of the homograft reaction will be discussed.

B.14: ARTERIAL PRESSURE FOLLOWING CANINE KIDNEY PRESERVATION, *Kenneth P. Sam*, Pete Jones, Graden Taylor, Sunday Fadulu, and John Session, Department of Biology, Texas Southern University, Houston, Texas 77004.

Canine kidneys were preserved in reconstituted homologous plasma for 12 hours at 4°C. Homologous plasma for kidney preservation was obtained from whole blood drawn from the femoral artery of adult mongrel dogs. The plasma was then reconstituted with distilled water, dibenzylidine, KCL, 25% mannitol, penicillin, and NaHCO₃ after the removal of labile lipo-proteins through millipore filtration. Arterial pressure was taken prior to removal of the left kidney. After twelve (12) hours of preservation, the left kidney was autotransplanted and arterial pressure taken immediately. This research is to study the relationship between rising arterial pressure and kidney *in vitro*.

Supported by NIH Grant Number PR08061-01.

B.15: CARDIOVASCULAR ALTERATIONS IN INTACT AND SPLENECTOMIZED DOGS DURING ACUTE OLIGEMIC SHOCK. Melvin A. Johnson, Jr., *Frieda M. Thornton* Gerald S. Friason, Central State University, Wilberforce, Ohio 45384.

Cardiovascular changes were studied in 17 non-splenectomized and 13 splenectomized dogs subjected to hemorrhagic shock. The control group and the splenectomized animals were bled to a mean arterial pressure of 40 mm. and hemorrhagic time, blood volume loss and other cardiovascular parameters were determined. The initial blood loss, bleeding time and total blood loss were markedly lower in the splenectomized group when compared to corresponding values of the intact animals. The difference in total blood loss between the two groups would suggest that the spleen contributes a little more than 16% of the total circulating blood volume. Hematocrit values were also markedly reduced in the splenectomized animals. This observation is not surprising in view of the red cell count of the spleen. Splenectomized dogs are more vulnerable than the intact ones to consequences of oligemic shock when equal volumes of blood are removed. When both are bled to the same hypotensive level, however, this hemodynamic disadvantage is nullified, for the contribution of the spleen in the intact animal necessitates the removal of a greater blood volume in order to achieve the desired hypotensive level.

B.16: THE CLINICAL MANIFESTATIONS, COMPLICATIONS AND MORTALITY OF ACUTE MYOCARDIAL INFARCTION IN A BLACK POPULATION, S. K. Chun, *M. C. Greene*, and S. F. Holly, Howard University, Freedmen's Hospital, Cardiovascular Research Lab., Washington, D.C. 20001.

This project was a retrospective analysis of Acute Myocardial Infarction as seen in Black Americans who had been admitted to and managed in Coronary Care Units in the Washington Metropolitan Area. It was designed to show the clinical manifestations and complications prior to admission and course of same in the CCU. Mortality rates, age and sex distribution were also determined. The medical records of 262 Black patients were reviewed. A male to female ratio of 1.6:1 was observed with an overall mortality rate of 19.8%. Of these 15% were male and 27.5% female. The incidence of diabetes mellitus and hypertension were high but similar in both sexes. There was a strong relationship between these diseases and the mortality rate for females but none for males with these risk factors. Painless infarct occurred in approximately 15% of cases, the majority of these having associated hypertension. There was a direct correlation between the rise of serum enzymes and prognosis of the acute myocardial infarction.

B.17: UTILIZATION OF THE G-BANDING PATTERN TECHNIQUE IN A DARYOTYPIC STUDY OF LEUKEMOGENESIS. *Sandra A. Murray* and John J. Session, Texas Southern University 3201 Wheeler St. Box 194, Houston, Texas 77004.

Neonates of the highly inbred mouse strain, C₅₇B1/6j, received 80 ug of 7-12 dimethylbenz anthrocene (DMBA) in two subcutaneous injections; separated by a twenty four hour interval. The DMBA was injected within seventy two hours after birth.

Leukemias of the thymic lymphosarcoma type were observed in eighty percent of the DMBA treated mice that were allowed to go until death. Karyological analyses of cells recovered from the thymus of the DMBA treated mice, at various intervals during the process of leukemogenesis, revealed a karyotypically heterogeneous cell population. The karyotypic abnormalities consisted of hyperdiploid, hypodiploid, pseudodiploid, and other types of aneuploidy. These abnormalities were quite obvious; however, additional, deleted, nor translocated chromosomes or parts of chromosomes could not be identified. Attempts will be made to identify these chromosome anomalies by the utilization of a G-banding staining technique which will allow for the identification of G-banding pattern on mammalian chromosomes. The significance of the utilization of this technique in the identification of chromosome anomalies will be presented.

BIOCHEMISTRY SESSIONS

BC.1: ON THE POSSIBLE INDUCTION OF THE COLLAGENASES IN *CLOSTRIDIUM HISTOLYTICUM*. *Collie E. Pettway* and *William T. Barnes*, Biology Department, Xavier University, New Orleans, La. 70125.

Because of their experimental and therapeutic value, it is desirable to increase the amount of collagenolytic enzymes elaborated by the bacterium *clostridium histolyticum*. One way to accomplish this is to induce the enzyme. At this time a limited number of proteolytic enzymes have been shown to be inducible; however no information is available concerning the collagenases. This talk will describe the results obtained from experiments in which varied nutritional conditions were utilized as inducers.

Supported by NIH Grant Number 1S06RR08008-01 and the Edward G. Schlieder Educational Foundation.

BC.2: ISOLATION AND CHARACTERIZATION OF A C₃H/He TUMOR VIRUS, *G. H. Jackson* and *E. V. Higginbotham*, Southern University, Baton Rouge, Louisiana 70813.

Female, C₃H/He, retired breeders were sacrificed before and after development of spontaneous tumors. The internal organs were observed for abnormalities, removed and fixed for electron microscopy. Lesions were observed on the small intestines of all animals sacrificed. The lesions and tumors which developed spontaneously were removed and used in infectivity tests. Embryos, aged 10-11 days were used as hosts. Both the lesions and tumor tissue showed the same effects on the chick embryos. The chicks which survived to hatching had swollen joints, enlarged abdomen, and had difficulty standing. Those inoculated with the tumor tissue died after 3-4 days following hatching. Upon dissection tumorous tissue was found beneath the skin. Tests for presence of bacteria and PPLO organisms in the lesion and tumor filtrates were negative. Electron microscopic studies are in progress.

BC.3: MECHANISM OF ACTION OF POLYCATIONS ON MITOCHONDRIAL OXIDATIVE REACTIONS, *D. S. Wong*, *M. Hillar*, Department of Biology, Texas Southern University, Houston, Texas 77004.

Polycations (like histones, protamine, synthetic polypeptides) exert a

variety of effects on mitochondrial oxidative/phosphorylative reactions (M. Hillar, *Acta Biochim. Polon.* 12, 133, 1965; 12, 379, 1965; *Biochim. Biophys. Acta* 97, 144, 1965; A. Schwartz *Circulation* 17, 555, 1965; *J. Biol. Chem.* 241, 4513, 1966; *Biochem.* 6, 1121, 1967). Polycations stimulate oxygen utilization by mitochondria in state 4, induce low amplitude swelling in cationic media and in the presence of phosphate, extrude potassium from mitochondria in an energy dependent and phosphate stimulated manner. The presented studies extended experiments on oxygen utilization by mitochondria in the presence of polycations utilizing various substrates and under various conditions. Detailed studies were performed on the effect of polycations in phosphate-containing and phosphate-free, KCl-containing and KCl-free media; also effects of uncouplers (DNP, FCCP, CCCP, -dicoumarol), energy transfer blocker (oligomycin), ionophores (valinomycin), and other active substrates (e.g. SH group active substances) were studied. The results obtained indicated that there is no direct correlation between the action of polycations and their molecular weight or charges. Moreover, some metabolic substrates as citrate exert modifying effects on polycation action. The results discussed in the light of previous finding and current knowledge of mitochondrial physiology lead to conclusion that the primary effect of polycations is blocking of proton transport across mitochondrial membrane. Other effects are consequence of this primary one.

Supported by NIH Grant Number 1S06RR08061-01.

BC.4: INFLUENCE OF SINGLET OXYGEN ON FATTY ACIDS OF VIABLE ATMOSPHERIC PARTICLES, *Betty Dowty* and John L. Laseter, Department of Biological Sciences; Gary W. Griffin and Ieva R. Politzer, Department of Chemistry, Louisiana State University in New Orleans, New Orleans, Louisiana 70122.

Exposure of pine pollen to singlet oxygen, generated in an aqueous environment, resulted in a decrease in the relative quantities of unsaturated fatty acids that could be recovered by solvent extraction of surface and near surface pollen lipids. The involvement of excited oxygen was confirmed by substitution of D₂O for water which led to an even greater decrease in unsaturated acids (twofold). Fungal spores similarly showed a decrease in unsaturated fatty acid upon exposure to singlet oxygen.

Allylic hydroperoxides (which have been shown to be toxic by Cortesi and Privett) and other oxidation products of exposure of oleic acid to ground state and singlet oxygen generated in an aqueous environment were separated by gas chromatography and liquid chromatography and

characterized by mass spectrometry. Mass spectra of compounds from gas chromatography were similar to mass spectra of compounds separated by ambient temperature liquid chromatography indicating that significant rearrangements and thermal decompositions were not occurring. The environmental and biomedical implications of these observations are discussed.

BC.5: CHEMICAL ANALYSIS OF THE CYST WALL OF *TELOTROCHIDIUM HENNEGUYI*, William W. Sutton, Lydia Manuel and Patricia Gibson, Department of Biology, Dillard University, New Orleans, La. 70122.

The cyst wall component of the peritrich *Telotrochidium henneguyi* has been isolated by mechanically breaking the encysted organisms in a micro-tissue grinder and separating the cyst wall material by differential centrifugation. A two step density gradient of 60% and 100% W/V sucrose in 0.01M NH_4HCO_3 was used. The isolated cyst wall material has been photographed.

Acid hydrolysates of the material were obtained using several different dilute acids (e.g. sulfuric acid, trichloroacetic acid, picric acid and sulosalicylic acid). The hydrolysates were neutralized with dilute sodium hydroxide and studied via thin layer chromatography. The chromatographic absorbent used was standard commercial Silica Gel G, and the solvent was n-butanol and acetic acid in water. Various bands have been observed. Rf values have been calculated and related to particular amino acids.

BC.6: ETHYLENEDIAMINE TETRAACETATE (EDTA) INHIBITION OF ALKALINE PHOSPHATASE FROM NORMAL AND LEUKEMIC TISSUES OF C57BL MICE, Mohammed Yahya and Judith Rae Lumb, Biology Department, Atlanta University, Atlanta Ga. 30314.

Alkaline phosphatase is a membranous enzyme found in some normal tissues and in the viral and chemically induced lymphomas in C57B1 mice. The enzyme is found in the thymus of a 16 day old mouse embryo, and then it disappears. The enzyme reappears in the lymphomas induced, by virus, chemicals and irradiation. It is not known whether the enzyme is viral induced, or derepression of the embryonic functions. Biochemical studies were undertaken to characterize alkaline phosphatase from the whole embryo, spleen, placenta and lymphomas, with respect to its inhibition with ethylenediamine tetraacetate (EDTA), and its possible reversal, with MgCl_2 and ZnSO_4 . The assay was done using Ammediol buffer @ pH 10, and pNPP as a substrate. EDTA alone inhibited activities of all-extracts; whole embryo

and placenta are partially inhibited by 0.1mM ZnSO₄. Magnesium activates activities of all extracts. Placenta and lymphoma H-58 show higher activation by Mg⁺². Magnesium but not Zn⁺² reverses the inhibition of EDTA in all tissues tested. There appears to be a synergistic effect of EDTA and Mg⁺² on the placental extract. These results indicate that EDTA is acting as a chelating agent for Mg⁺², since the addition of Mg⁺² overcomes the inhibitory effect of EDTA.

Supported by NSF Grant GY-10465.

BC.7: HYPOGLYCEMIC FACTOR FROM INVERTEBRATES (*DROSOPHILA MELANOGASTER*) PRELIMINARY REPORT. *Patricio Meneses*, Maria de los Angeles Ortiz, Daniel Cruz Batiz, Guillermo Rosario, Jose Maldonado, Carmen Nunez, Nelson Rosario, Nelson Padilla, Catholic University of Puerto Rico, Ponce, Puerto Rico 00731.

Looking for the mechanism of glucose penetration across the cell membrane in insects, we found a protein hypoglycemic factor. That factor shows a strong effect in mice. Methods and statistical analysis of results are reported here.

BC.8: CHEMICAL CARCINOGEN INDUCED SYNTHESIS OF MICROSOMAL HYDROXYLASE: ITS RELATIONSHIP TO THE METABOLISM OF ENVIRONMENTAL TOXINS, *Lawrence Alfred*, Biology Department, Federal City College, Washington, D.C., 20005.

Microsomal hydroxylase is a mixed-function oxidase which is involved in the metabolism of barbiturates, pesticides, certain lipophilic endogenous substrates, and polycyclic hydrocarbons (PH). Certain PH's are ingested by man, and their metabolism is extremely important in relationship to drug effectiveness and to chemical carcinogenesis. PH induction of the microsomal hydroxylase enzyme system, aryl hydrocarbon hydroxylase (AHH) in rodent cell cultures was first demonstrated by Alfred and Gelboin, 1968. The kinetics of the induction phenomenon, and initial requirement for RNA synthesis, and a requirement for continuous protein synthesis were shown. The objective of the present studies was to relate the induction of AHH to the period of restriction of the expression of genetic information in DNA prior to differentiation (proposed function of nuclear proteins). Vertebrate and invertebrate embryos at varying stages of development were analyzed in attempts to define a specific period where tissues become inducible for AHH. Target tissues were exposed to PH either

transplacentally or in cell cultures derived from different developmental stages. Enzyme synthesis, binding to macromolecules, and metabolite formation were measured. Results: Hamster cells at stages prior to organogenesis were incompetent for AHH induction, but induction competency developed just before or at the onset of organogenesis. The rate of enzyme synthesis or accumulation proceeded linearly thereafter. Treatment of developing sea urchin embryos with PH resulted in a pattern of metabolism of the parent PH to aqueous soluble metabolites similar to that in mammalian cells. Treated sea urchin showed an impairment of lysine-³H incorp. into the chromatin fraction as compared to untreated controls. Whether or not this expression of genetic information can be correlated with nuclear histone biosynthesis is one of the major points of interest in our present research efforts. Thus, the induction of AHH beginning only at a particular point of differentiation may suggest a specific capacity for gene-carcinogen interaction at early development.

BC.9: REGULATION OF GLUTAMATE DEHYDROGENASE ACTIVITY IN MITOCHONDRIA BY NUCLEOTIDES AND STEROIDS, M. Hillar, D. S. Wong, Department of Biology Texas Southern University, Houston, Texas 77004.

Activity of the isolated glutamate dehydrogenase is regulated by purine and pyrimidine nucleotides, by steroid hormones and some other substances. However, no studies were reported on its regulation in intact mitochondria. Glutamate dehydrogenase activity in rat liver mitochondria was measured in both directions-reductive amination of α -oxoglutarate (backward reaction) and glutamate oxidation (forward reaction) using colorimetric technique for d-amino nitrogen or polarographic technique for oxygen. These techniques were supplemented with spectrophotometric technique for reduced NAD in mitochondria (using Aminco DW2 Spectrophotometer). It was found that ADP stimulates the synthesis of α -amino nitrogen by mitochondria in the reaction of aerobic dismutation of α -oxoglutarate. It inhibits only the synthesis of α -amino acid with succinate as hydrogen donor by blocking the reversed electron transport. Glutamate oxidation by mitochondria in the presence of arsenite and dinitrophenol is diminished by ADP. The results indicate that nucleotides exert some regulatory role in intact rat liver mitochondria upon glutamate dehydrogenase; progesterone affects only isolated enzymes.

Supported by NIH Grant Number 1S06RR08061-01.

BC.10: HEAT INACTIVATION OF ALKALINE PHOSPHATASE IN MOUSE LYMPHOMA AND FETAL TISSUES, Verlie A. Tisdale and Judith Rae Lumb, Biology Department, Atlanta University, Atlanta, Ga. 30314.

Alkaline Phosphatase, an enzyme not normally found in lymphocytes after 16 days gestation, in C57B1 mice, has been associated with chemical and viral induced lymphomas. The question remains unanswered as to whether this enzyme is coded for by the virus nucleic acid and brought into the cell with the virus or whether it is coded for by the cell and remains inactive unless activated by some stimulus. A similar situation exists in the demonstration of a placenta-like alkaline phosphatase found in human tumors. Tissues used in this research are C57B1 mice spleen, whole embryo, placenta, and tumors. This investigation consists of biochemical characterization of alkaline phosphatase activity that occurs in whole embryo spleen, and placenta of C57B1 mice as compared to that of viral and chemical induced thymic lymphomas of that strain. One criteria for distinguishing different alkaline phosphatase (APase) activities is the use of heat inactivation tests. The investigation was carried out by performing heat inactivation using p-nitrophenyl phosphate as a substrate. APase activity of the placenta and whole embryo appears to be less heat stable than that of the spleen and lymphoma. APase activity of placenta looks different from lymphoma, and is therefore not analogous to human placenta APase.

Supported by NSF Grant Number GY-10465.

BC.11: THE RESOLUTION AND ESTIMATION OF RNA HYDROLYSIS PRODUCTS BY THIN LAYER CHROMATOGRAPHY AND SPECTRAL ANALYSIS, Leonard Price, Bobby Burks, and Joseph Lanaux, Department of Chemistry, Xavier University, La. 70125.

Base analysis is one of the standard techniques for characterization of ribonucleic acids. From different plant and animal sources ribonucleic acids were isolated and separated into cytoplasmic and nuclear fractions. These fractions were then hydrolyzed into products which are separated by thin layer chromatography on cellulose using methanol - HCl - water (70:20:10). Detection was by UV, extraction with 1 N HCl, and quantitation by spectral analysis.

Supported by NIH Grant Number 1S06RR08008-01.

BC.12: PROCEDURES USED IN THE STUDY OF THE EFFECTS OF THE METABOLISM OF 3,4-BENZO(A)PYRENE (BaP) BY DEVELOPING MAMMALIAN EMBRYONIC TISSUES. Diana Simon, Christine Roberts, *Walter Cromer*, and Lawrence Alfred, Biology Department, Federal City College, Washington, D.C., 20005

It has been suggested that 90% of human cancer is caused by environmental chemicals, and the causative agents may be epoxides which are intermediates in the oxidation of polycyclic hydrocarbons (PH) to phenolic derivatives. Many such chemicals, including BaP or its metabolites, bind covalently to cellular macromolecules. This binding capacity may represent an essential step in the initiation of chemical carcinogenesis. We would like to present a general protocol of work which is being conducted in our laboratory on this problem. We are attempting to analyze the effects of unlabeled and radioactively labeled BaP on developing hamster embryonic tissue with respect to: (a) binding of BaP to cellular macromolecules, (b) formation of BaP metabolites, and (c) the electrophoretic patterns of histones on acrylamide gels. Pregnant hamsters are injected with cottonseed oil or with cottonseed oil containing BaP to deliver 100 mg/kg body wt. 24 hours prior to sacrifice. Embryonic or fetal tissues are collected, homogenized, and subjected to various extraction procedures to isolate the nuclear and the cytoplasmic fractions. Both fractions are analyzed for the binding of BaP to macromolecules, concentrations of metabolites in the aqueous phase, and the nuclear fraction is further purified for basic proteins. The isolated histone fraction from the nuclear portion is then subjected to disc gel electrophoresis, and the migration patterns of control and BaP-treated samples are compared by spectrophotometric scanning, and specific radioactivity of the isolated bands. Preliminary results show a correlation between the binding of BaP or its metabolites to cytoplasmic macromolecules and the appearance of such metabolites in the aqueous fraction. Further results on the separation and characterization of histone fractions following PH treatment will be reported.

BC.13: THE ISOLATION OF CLOSTRIDIOPEPTIDASE A FROM *CLOSTRIDIUM HISTOLYTICUM* FILTRATES. *Gerard Johnson* and William T. Barnes, Biology Department, Xavier University, New Orleans, La. 70125.

A multiple number of collagenases exist in the filtrates of *Clostridium histolyticum*. It has been demonstrated that they share similar characteristics such as a calcium dependence for activation and a molecular weight of approximately 110,000. Due to the similarity in molecular

weights, it is not possible to separate these enzymes on adsorbents which discriminate molecules on basis of size. The purpose of these studies is to investigate other methods for separating Clostridiopeptidase A from the other collagenases in the filtrate. This paper will discuss these results.

Supported by NIH Grant Number 1S06RR08008-01 and the Edward G. Schlieder Educational Foundation.

BOTANY SESSION

BT.1: THE USE OF COMMELINA AS AN ORGANIC COMPUTER FOR DETECTING EVOLUTIONARY RELATIONSHIPS BETWEEN ANIMALS, *Frank R. Davis*, Department of Biology, Paine College, Augusta, Georgia 30901.

In previous studies *Commelina* cuttings have been employed to show evidence of degrees of kinship or evolutionary relationships between several species of Magnoliaceae, *Yucca-Agave* types, and leaf developmental stages in *Platanus occidentalis*. This has been achieved by the following physiological technique. *Commelina* cuttings were first inserted (separately) in 55 X 20 millimeter vials containing crude aqueous leaf extracts from specimens to be tested – the first node of each cutting (measuring up from cut end) extending 3 to 6 millimeters above the surface of the liquid. Then the average numbers of days required to initiate root-primordia visibility at the first node were compared statistically.

In the present study the procedure is fundamentally the same as in previous studies except that animal as well as plant tissues are involved. *Commelina coelestis* cuttings are set up for comparisons in six separate media: water, crude aqueous *Commelina coelestis* leaf extract, and crude aqueous liver extracts from *Bos taurus*, *Gallus domesticus*, *Rana pipiens*, and *Mugil cephalus*. Results, though physiological and embracing both animal and plant kingdoms, are in progressive evolutionary sequence as suggested in comparative anatomy, embryology and paleontology. Results also, when compared with previous studies, suggest the extent and direction of progressive evolution as compared with diversified evolution.

BT.2: LOSS OF PATHOGENICITY OF AGEING CULTURES OF *PSEUDOMONAS TABACI* AND FATTY ACID COMPOSITION. *Edith Cheri*, Callistus Agochukwu and Paul Sacco, College of Pharmacy, Xavier University, New Orleans, La. 70125.

Chemotaxonomic studies have contributed importantly to the clarification of certain interspecific relationships within the plant kingdom. An understanding of the loss of phytotoxic capacity by the "wildfire" organism has been challenging for nearly 50 years.

Fifteen variants from a two year old stock culture of *P. tabaci*, distinctive in morphology and color characteristics made visible by 2,3,5,

Triphenyl 2H-Tetrazolium Chloride were compared with parent and type culture for Fatty Acid (FA) composition and phytotoxicity. All strains in the FA studies were grown in enriched liquid medium at 31°C to near-stationary phase, cells harvested by centrifugation, washed free of medium, saponified, FA purified, esterified, analysed by Gas Liquid Chromatography and quantized with digital integrator. Screening for phytotoxicity was by injection of 24 hr. cultures into interveinal areas of *Nicotina tabacum* Var. *Swarr-Hibshman* leaves.

Preliminary data reveals significant variation in FA spectra. Uniformity came closest in C16:0 (16 of the 17 cultures positive) and 15 for C14:0. Differences increased markedly for other components eg., 10-C16:1, 9-C18:0, and 8-C12:0. Distribution of FA fractions ranged from 47 sec. Retention time to 828 sec. Effort continues in the characterization of some of these. Regarding pathogenicity, only the type culture produced typical "wildfire" symptoms. This study is being extended to include other pseudomonad pathogens which now seems indispensable for resolving this chemotaxonomic problem.

Supported by NIH Grant Number 1S06RR08008-01.

BT.3:PERFORMANCE OF DIPLOID AND TETRAPLOID *EUPHORBIA LAGASCAE* PLANTS. *Jarnail Singh*, Stillman College, Tuscaloosa, Alabama 35401.

Euphorbia lagascae S. seeds contain 4 percent oil and 71 percent vernolic acid. Due to high economic importance of the plant, this species has been evaluated for yield characteristics but so far no effort has been made to improve the performance of this species by breeding. In this paper the results of the performance of diploid and artificially induced tetraploid plants are reported. Tetraploids were not significantly taller in plant height than the diploids at any state of growth. Tetraploids had larger leaf size, larger stomata size, less pollen germination and more vernolic acid contents than the diploids. The seed yield, dry weight of foliage and the oil contents of tetraploids were not significantly higher than the diploids.

BT.4: PARTIAL PURIFICATION OF MYCOTOXIN FROM ASPERGILLUS SPECIES BY ION-EXCHANGE CHROMATOGRAPHY. *Pete Jones*, Kenneth Sam, Sunday Fadulu, and John J. Session, Department of Biology, Texas Southern University, Houston, Texas 77004.

The culture used in this study was isolated from Houston soil. The mycelium from seven (7) day cultures grown in asparagine synthetic medium

was harvested by filtration. The washed mycelium was suspended in cold 0.02 m. phosphate buffer (pH 7.3) and homogenized in an omnimixer. The material was ground in a teflon tissue grinder, and centrifuged at 5,000g's for 45 minutes. The supernatant was dialyzed against several changes of 0.002 m. phosphate buffer (pH 7.3) over a period of 72-96 hours. All procedures were carried out at 4°C. The dialyzate was filtered to remove insoluble material. The final preparation was used as the crude endotoxin (mycotoxin). DEAE-sephadex was prepared and packed into a 1.2 x 45 cm. glass column and equilibrated with pH 8.0 phosphate buffer. Five (5) ml. of the endotoxin was introduced into the column and subjected to gradient elution with increasing molarity and decreasing pH from 8.0-3.0. Optical densities of the fractions at 280m and 260m were determined spectrophotometrically. The characteristic toxin in each fraction pool was then injected into the Gastrocnemius muscle of a frog, demonstrating that one fractional pool clearly produced pronounced depolarizing effect on neuromuscular blockage. This is the initial step in purifying the indotoxin (mycoxin) and will lead to its exact chemical identification.

Supported by NIH Grant Number PR08061-01.

BT.5: A STUDY OF VITAMIN REQUIREMENT IN THE CELLULAR SLIME MOLD *DICTYOSTELIUM DISCOIDEUM* GROWN IN A SEMI-DEFINED MEDIUM. A. C. Washington and Leaneur Randall, Langston University, Langston, Oklahoma 73050.

Previous results of Washington and Roth showed that *Dictyostelium discoideum*, strain ax-1, could grow in an axenic medium supplemented with vitamins (SA). In the present work results from single deletion experiments indicated that a specific vitamin, in this medium, was necessary for rapid cell division. Vegetative cells or amoebae grown in Sa medium had a generation or doubling time of 10 to 12 hours and reached a maximum of 2.0 to 2.5 x 10⁷ cells/ml in 72 hours from an initial inoculum of 4 x 10⁵ cells/ml. However, vegetative cells grown in SA minus added vitamins reached the same cell density but in approximately 120 hours. Generation time was approximately 24 hours. When Folic acid was added to cells grown without added vitamins, the generation time increased to approximately that of cells grown in SA. The number of cells present in each experiment was determined with a hemocytometer.

BT.6: RNA POLYMERASE FROM THE SLIME MOLD, *PHYSARUM POLYCEPHALUM*, Evangeline Wiggins and Joe Johnson, Jr., Department of Chemistry, Atlanta University, Atlanta, Georgia 30314.

This investigation was designed to open avenues into systems that can be used to evaluate transcriptional control mechanisms in an eukaryotic organism capable of differentiation. It was proposed that since the immediate products of gene expressions are reflected in ribonucleic acid (RNA), a thorough study of RNA polymerase core enzyme and sigma factors, which are responsible for RNA synthesis, be undertaken in a system that exhibits varied growth patterns.

Several recent biochemical studies of *P. polycephalum* have indicated that some classes of RNA are depressed and that some new classes are synthesized at various stages of growth (differentiation). Therefore, it seems appropriate to evaluate the role of RNA polymerase core enzyme and sigma factor(s) in controlling these gene expressions.

We will show how the organism can be grown axenically (in pure culture without host bacterial source) in flask cultures and on fermentation scale (25 liters) and the stage at which maximum amounts of enzyme were produced. We utilized the definition of an enzyme unit as being the incorporation of one m mole of ^{14}C -UTP into RNA per ml of enzyme extract when incubated in the standard reaction medium under standard conditions for one hour. 49 to 50 units of activity were detected after 36 hours in intact nuclei and 72 units were detected in partial solubilized preparations from these same nuclei. These determinations represent several runs and were quite reproducible. We were also able to solubilize the enzyme to the extent of only 20 to 30% with sodium deoxycholate and a similar amount by sonification. We will describe the membrane bound nature of this RNA polymerase enzyme.

CHEMISTRY SESSIONS

C.1: THE CRYSTAL AND MOLECULAR STRUCTURE OF S-(10-PHENOXARSINYL) PHENOTHIAZONIUM CHLORIDE, Jane Richardson and Sr. Mary Carl Malmstrom, Department of Chemistry, Xavier University, New Orleans, La. 70125.

The crystal structure of S - (10-phenoxarsinyl) phenothiazonium chloride is being determined from three dimensional X-ray diffraction data collected with a Weissenberg camera using $\text{CuK}\alpha$ (λ 1.5418Å) and using multiple film techniques. The space group is $\text{P2}_1/\text{n}$ (Monoclinic 14). The unit cell parameters are $a = 5.703(4)$, $b = 14.659(7)$ and $c = 12.988(7)$ Å; $\beta = 95.43(8)^\circ$, $Z =$ and $D_{\text{calc}} = 2.832$.

The structure is being determined by the Patterson method using 940 observed reflections. It will be refined by full matrix least squares. One point of interest is to ascertain if the molecule is planar or folded along the S-N or As-O axis and, if so, determine the measurement of the dihedral angle. Other structural interests are the C-S, C-N, and As-S bond distance, and the ionic or covalent properties of the molecule.

Supported by NSF Grant Number GY-10444.

C.2: GAS-SOLID THERMODYNAMIC VALUES FROM PIEZOELECTRIC SORPTION DETECTORS, *C. M. Earnest*, Stillman College, Tuscaloosa, Ala. 35401, and *A. F. Findeis*, University of Alabama (Tuscaloosa), University, Ala. 35486.

Thermodynamic values for the interaction of many organic vapors with several solid surfaces have been determined by use of a piezoelectric sorption detector (PSD). These values are shown to be equivalent to those obtained from gas-solid chromatography. The PSD utilized 9MHz, AT cut piezoelectric quartz crystals.

The change in frequency of vibration of the quartz crystal was used to determine the weight of vapor sorbed on its solid surface coating. The weight of vapor sorbed along with a knowledge of the detector volume, crystal electrode surface area, and total weight of sorbate used were employed to calculate the gas-solid partition coefficient, K , for each isothermal study. The heats of sorption, ΔH , were obtained from the variation of the weight of vapor sorbed with temperature. The free energies of sorption, ΔG , and the entropies of sorption, ΔS , were subsequently calculated from relationships involving K and ΔH .

The thermodynamic values thus obtained were correlated with the intermolecular forces involved in the sorption process as well as the nature of the sorbent surface.

C.3: INDUCED ELECTRON EMISSION SPECTRAL STUDY OF ION EXCHANGE CELLULOSE. *D. M. Soignet*, R. J. Berni, and R. R. Benerito, Southern Regional Research Laboratories, Southern Region, ARS, USDA, New Orleans, La. 70179.

Induced electron emission spectroscopy (ESCA) has been used in many areas of chemistry to acquire information relative to the chemical environment of atoms in complex molecules. We have employed this method to distinguish between tertiary and quaternary nitrogens present in diethylaminoethylated (DEAE) cellulose and the quaternized forms of DEAE cellulose. DEAE cellulose, considered to be a weak base anion exchanger consisting of tertiary amino groups attached to the cellulose backbone, was found to contain these tertiary amino groups together with some quaternary amino groups. Treatment of DEAE cellulose with methyl iodide converts most of the available nitrogens to quaternary ammonium groups. Treatment with 1,2-dibromoethane is less efficient.

C.4: MOLECULAR ASSOCIATIONS BETWEEN ACETYLCHOLINE AND AROMATIC COMPOUNDS IN AQUEOUS SOLUTION, M. J. Minch, *J. P. Sevenair* and G. Weinberg, Chemistry Department, Tulane University, New Orleans, La., 70118.

Weak molecular associations between the acetylcholine cation and aromatic carboxylate and sulfonate anions can be studied by nmr. When the sodium salts of such aromatic anions (e.g. sodium toluate) are added to a D₂O solution of acetylcholine chloride, the acetylcholine N-methyl proton singlet is shifted upfield toward the C-methyl singlet and the dependence of this upfield shift on aromatic anion concentration can be related to the equilibrium constant *K* for the association. There is a greater association with aromatic sulfonates than with carboxylates and *K* increases with increased alkylsubstitution on the aromatic ring, suggesting that hydrophobic interactions are involved. Because this upfield shift is due to the ring current of the aromatic anion, the aromatic ring must be interacting primarily with the quaternary nitrogen group. Consistent with this view is the fact that similar chemical shift changes are caused by neutral aromatic compounds where only hydrophobic interactions between the ring and the quaternary nitrogen group can be involved; however in such cases the *K* values are smaller than for cation-- anion associations.

Associations involving other cations and associations involving acetylcholine and various neuro-active aromatic compounds are also being investigated.

C.5: THEORETICAL STUDIES OF DRUG-RECEPTOR COMPLEXES: HISTAMINE CATION - CARBOXYLATE ANION. *Arlene Roberson* and *Joyce H. Corrington*, Department of Chemistry, Xavier University, New Orleans, La. 70125 and *Vernon B. Haarstad*, Department of Pharmacology, Tulane University School of Medicine, New Orleans, La. 70112.

Recent theoretical studies by Kier, employing non-iterative Extended Huckel Theory (EHT), investigated molecular configurations corresponding to a minimized sum of orbital energies (SOE) for a series of neural transmitters including histamine. However, studies of drug-receptor complexes have not previously been undertaken. ARCANA (a semi-empirical molecular orbital calculation program which improves on EHT by taking into account charge migration and neighbor atom potentials and by iterating to self-consistency) was selected to study drug-receptor complexes since it had been shown to give good hydrogen bonding distances and energies. Prior to this work we employed ARCANA to calculate with reasonable accuracy the acetic acid dimer bond distance and bond energy (EHT-SOE did not predict bonding for the dimer).

As a prototype complex, methylamine-acetic acid was studied. $\text{N}^+\text{H} \dots \text{O}^-$ distance scan from infinity to 2.8 Å resulted in a flat energy surface in to a distance of 3.2 Å. At this configuration a single (and double) proton scan resulted in an energy "well" at 1.6 (and 1.3) Å from the nitrogen. The histamine molecule was substituted for the methylamine and a similar series of distance scans calculated. Comparisons of the complex to the separate cation and anion will be made.

Supported by NIH Grant Number 1S06RR08008-01.

C.6: MOLECULAR ORBITAL STUDIES OF THE MAST CELL ZINC-HISTAMINE STORAGE COMPLEX. *M. F. Murphy*, *V. B. Haarstad*, and *F. B. Hahn*, Tulane University School of Medicine, New Orleans, La. 70112 and the University Freiburg i. Br., West Germany.

A zinc: histamine: heparine ternary complex has been proposed by Kerp (Intern. Arch. Allergy Appl. Immunol. 22; 112, 1963) as the storage form of histamine in rat mast cells. A ring nitrogen and the ethylamine nitrogen of two histamine molecules in a square planar arrangement about one divalent zinc ion may intercalate with a portion of the heparin molecule such that two sulfonic acid residues provide the fifth and sixth coordinating ligands above and below the plane of the zinc-histamine complex. Semi-empirical molecular orbital calculations employing the Cusachs non-Huckel one electron method indicate that there is little or no covalent

bonding between the Zn atom and the donor nitrogen atoms. Thus, the stability of the complex would appear to be owing to electrostatic interactions. These data correlate well with the demonstrated ease of liberation of histamine from mast cells. Other modes of binding will be discussed.

Supported by NIH Grant Number GM 17124 and by the Edward G. Schlieder Educational Foundation.

C.7: THE INTERACTION OF CARBON MONOXIDE WITH HEMOGLOBIN, *Peter Politzer* and Stephen D. Kasten, Chemistry Department, Louisiana State University in New Orleans, New Orleans, Louisiana 70122.

It has been suggested, on the basis of isotopic infrared frequency shifts, that carbon monoxide bonds to hemoglobin through the oxygen end of the molecule rather than the carbon. This unusual interpretation prompted us to make some simple extended-Huckel calculations on the Fe(II) - CO system, using Fe(II) in the state that has been found for it in previous computations dealing with hemoglobin.

We found the most stable system to be the linear Fe(II)-C-O structure. However, we also found a second stable form, which is bonded through the oxygen and is bent: Fe(II)-O-C. Considerable variation of the input parameters of our calculation did not affect this result.

The nature of the carbon monoxide - hemoglobin interaction remains highly speculative. However the fact that we do obtain a stable bent form bonded through oxygen, plus experimental evidence that CO does form bent structures on hemoglobins and myoglobins, gives some support to the original suggestion that the bonding involves the oxygen end of carbon monoxide.

C.8: HYDROGEN BONDING STUDIES WITH THE ARCANA MO PROGRAM, Haven S. Aldrich, *L. Chopin Cusachs*, and Lee P. Gary, Jr., Department of Chemistry, Tulane University, New Orleans, La. 70118, and Department of Mathematical Sciences, Loyola University, New Orleans, La. 70118.

Hydrogen bonding in a series of 1:1 molecular complexes involving H₂O, NH₃, HN, HF, and HCl was studied to determine the adequacy of the ARCANA technique in applications to drug-acceptor complexes and mechanisms of action. Calculated hydrogen bond energies are in encouraging

agreement with experimental data and compare favorably with recent *ab initio* and other approximate MO calculations. For example, we obtain a linear water dimer with a stabilization of 3.5 kcal/mole and a hydrogen bond distance of 2.87Å. These results suggest the ARCANA technique may be used with confidence in problems depending on reasonable prediction of hydrogen bonding tendencies.

C.9: A THEORETICAL STUDY OF THE BARRIERS TO ROTATION IN H_2S_2 , H_2Se_2 , AND H_2Te_2 . *W. L. Thornsberry, Jr.*, Freeport Sulphur Co., Belle Chasse, La., and *L. C. Casachs*, Loyola University, New Orleans, La. 70118.

A series of semi-empirical LCAO-MO calculations has been made in which the barriers to internal rotation in H_2S_2 , H_2Se_2 and H_2Te_2 were determined using the ARCANA program. This program makes use of calculated or observed atomic orbital data but avoids the use of parameters from other calculations or from observed molecular properties. Therefore, this method enables the prediction of molecular data from atomic data rather than depending on an interpolation or extrapolation of other molecular data.

Single Slater type orbitals are used to represent the atomic orbitals and it therefore is important that the optimum representation of a single Slater type orbital (STO) be determined for use in molecular calculations. The rotational barriers were calculated using single STO's determined by four different methods in order to evaluate the effectiveness of these atomic data in predicting molecular geometry, energy barriers and charge distributions.

The evaluation of atomic orbital data should be of interest for the application of these data to theoretical studies relating to a number of biochemical applications. For example, the mechanism of the reaction of radicals or ions with divalent sulfur, particularly the disulfide bond, is important since sulfur atoms are very susceptible to attack by radicals and nucleophiles. Radiation damage to enzymes and proteins can occur through attack on their disulfide bonds. Finally, the use of selenium analogs of biosulfur compounds has been reported to be important in the detoxification of mercury and possibly other heavy metals.

C.10: LOW TEMPERATURE MAGNETIC PROPERTIES OF OXYGENATED CRYSTALLINE HUMAN HEMOGLOBIN. *Larry P. Thompson* and *Arthur N. Thorpe*, Howard University, Washington, D.C.

Room temperature magnetic susceptibility measurements of oxygenated crystalline human hemoglobin have been made as a function of

oxygen pressure. It has been observed that the susceptibility decreases with increasing oxygen pressure, until saturation begins at a pressure of approximately 1.25 atmospheres.

From a selective few of the above samples, measurements of susceptibility from room temperature down to liquid nitrogen temperature have also been made. The data from these experiments have been used to determine the magnetic moments of the samples. A plot of magnetic moments against the pressures at which the samples have been oxygenated shows that the moments increase linearly with oxygen pressure initially, but again saturation is observed to begin at about 1.25 atmospheres.

C.11: THE RAPID REMOVAL OF TOXIC METAL IONS FROM INDUSTRIAL WASTE WATER BY EXTRACTION. *Curtis W. McDonald* and Thornton Rhodes, Department of Chemistry, Southern University, Baton Rouge, Louisiana 70813.

High molecular weight amines dissolved in common aromatic solvents are highly efficient solvent extraction systems for the removal of the highly toxic mercury and cadmium ions from aqueous solutions. These low cost industrial amines can extract the toxic ions essentially quantitatively at both the macro and subnanogram levels. The high molecular weight quaternary ammonium salts are especially attractive because of their ability to extract cadmium and mercuric ions from alkaline as well as acidic solutions.

The extracted cadmium and mercuric ions can be separated by selective stripping with aqueous ammonia or ethylenediamine solution. The degree of extraction and stripping is readily followed by using cadmium (109) and mercury (203) and counting their gamma activity. Industrially, these extraction systems can be applied to the removal of toxic ions generated from mercury cells used in chlorine production and munitions manufacturing plants.

C.12: A COMPARISON OF SPECTROPHOTOMETRIC AND FLUOROMETRIC METHODS FOR VITAMIN B₁₂ ASSAY AFTER RESOLUTION BY GEL CHROMATOGRAPHY. W. D. Moore, *S. Tobias* and E. Washington, Dillard University, New Orleans, La. 70122.

The structure and total synthesis of vitamin B₁₂ (cyanocobalamin) have been well documented within the past decade. Because of its unique biochemical actions and the consequences of a deficiency of this vitamin in a variety of animal life, methods of isolating and assaying this substance are

still of current interest. It has been established that the structure of vitamin B₁₂ is basically that of a porphyrin. The structure determined by x-ray methods (1964 Nobel price in chemistry), adequately confirmed this central porphyrin-like structural feature. This report covers the preliminary results of our attempt to resolve vitamin B₁₂ from food and medicinal substances by gel chromatography and the subsequent assay by spectrophotometry and fluorometry.

C.13: THE CRYSTAL AND MOLECULAR STRUCTURE OF 2-METHOXYPHENOTHIAZINE. *Coleridge Franklin* and Sr. Mary Carl Malmstrom, Department of Chemistry, Xavier University, New Orleans, La. 70125.

The crystal structure of 2-methoxyphenothiazine is being determined by three-dimensional X-ray diffraction techniques with the data being collected on film with a Weissenberg camera using copper radiation. Since a suitable crystal has just been obtained, it appears, at this point, to belong to the orthorhombic group; although this has not been confirmed. The unit cell parameters based on preliminary data are $a = 8.264$, $b = 5.705$ and $c = 11.627$.

Interest in phenothiazines in general has been generated because of their use in psychotherapy. Some relationship between molecular structure and use has already been formulated. It is hoped that the solution of this structure will provide additional information in this area.

Supported by NIH Grant Number 1S06RR08008-01.

C.14: THE SYNTHESIS OF DIBENZOCYCLOHEPTENOYLPIPERAZINE DERIVATIVES, *Bobetta Jones, Myra McCoy and J. H. Sayles*, Chemistry Dept., Bennett College, Greensboro, N.C. 27420.

A number of N,N'-disubstituted piperazine derivatives and dibenzocycloheptenoylpiperazine derivatives have been found to possess pharmacologically active properties, especially as antihypertensive, sedative, myorelaxant, local anesthetic, analgesic and antipyretic agents. The purpose of this investigation was to synthesize a series of new en-amine dibenzosuberene derivatives and to determine the pharmacological properties of each compound. The syntheses and characterization operations were made in our laboratory. The pharmacological properties were determined at the Richardson-Merrell Laboratories.

The first step in the reaction sequence involved the formation of a

reactive ARYNE ionic species. The aryne is then made to react with a piperazine derivative to give a N-[5H-Dibenzo-(a,d)-cyclohepten-5-one-10-yl]-N¹- alkyl or aryl piperazine. The product was recovered from the reaction mixture by extraction and purified by recrystallization. The assignments of formulas to the new compounds were fully supported by spectroscopic characterization and other operations on the purified products. Antiinflammatory activity on rats and hypotensive activity in cats has been promising. Additional tests are yet to be made in this connection. Results of each preparation will be presented and discussed.

C.15: CHLORINE OXIDATION OF METHYLTHIOPYRIDAZINES, *Wilbert L. Williams*, Claude M. D'Antonio, Duane L. Aldous, Xavier University of Louisiana, College of Pharmacy, New Orleans, Louisiana 70125.

Methylthiopyridazines exist in nine possible isomeric forms. Our objective is to synthesize these nine isomers and subject them to oxidation with chlorine gas in various solvents and under different temperatures. Various nucleophilic displacements have been reported in the literature. The methylthio group has been replaced by hydroxyl, methoxyl and chlorine as well as being oxidized to the methylsulfone.

Three methylthiopyridazines (3,6;3,4,5 and 3,4,6) were prepared and subjected to oxidation with chlorine gas in aqueous-methanol solutions. The products of these oxidations are being analyzed (I.R. and elemental analysis). Significant progress toward the synthesis of 3; 4; 3,4 and 4,5 methylthiopyridazines was made. More serious difficulties were encountered in the synthesis of 3,5-bismethylthiopyridazine and the tetrasubstituted derivative has not been attempted.

Supported by NIH Grant Number 1S06RR08008-01.

C.16: LEWIS ACID CATALYZED REACTIONS, *S. Munavalli*, Chemistry Department, Livingstone College; *D. G. Doherty*, Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee; and *S. H. Dandegaonkar*, Chemistry Department, Shivaji University, Kolhapur India.

Treatment of the creosyl acetate with anhydrous aluminum chloride in dry methylene chloride at 0°C produced a m-substituted (C-acylated) Fries rearrangement product. However at room temperature both C- and O-acylated products were obtained. The formation of these abnormal compounds is explained on the basis of the involvement of both

intramolecular and intermolecular rearrangements. The possibility of transesterification or the so-called ester exchange has been ruled out on the basis of additional experimental results. The temperature dependence of these reactions has clearly demonstrated the nature of the rearrangement. In addition, even under the conditions of Friedel-Crafts reaction both C- and O-acylations took place simultaneously. Further condensation of cyclic anhydrides with the same substrate during the Friedel-Crafts acylation reaction exclusively gave the O-acylated product. The course of these interesting reactions will be discussed.

C.17: THE PREPARATION AND REACTIONS OF A "NEW" PORPHYRIN. *Sandra F. Squirewell* and John A. Weaver, Department of Chemistry, North Carolina A&T State University, Greensboro, North Carolina 27411.

A compound was obtained by refluxing 2-thiophenecarbaldehyde with pyrrole under acidic conditions. The compound dissolves very slowly in chloroform and pyridine, but is practically insoluble in other solvents. The UV-visible spectra reveal four main absorption peaks in the region 700-500 nm with one intense peak in the region 500-400 nm. We have tentatively named the compound *meso*-tetra-2-thiopheneporphyrin.

When reacted with copper ions, the four visible peaks disappear and two new peaks are found. The ultraviolet peak was unaffected.

C.18: COMPLEXES OF GOLD (I) COMPOUNDS AND TETRAZOLES. Charles Winfrey, Department of Chemistry, Xavier University, New Orleans, La. 70125, and Hans B. Jonassen, Department of Chemistry, Tulane University, New Orleans, La. 70118.

Since gold and some tetrazoles are antiarthritic agents a study of their complexes became of interest. The phase of the study reported here involved the preparation and the study of the physical properties of a series of gold (I) complex. AuClPPh_3 was used as the starting material; it was allowed to react with Silver acetate to produce AuAcPPh_3 . This was then allowed to react with 5-aminotetrazole and 5-trifluoromethyltetrazole. The physical properties of the complexes formed will be discussed in some detail.

Supported by NIH Grant Number 1S06RR08008-01.

MEDICAL TECHNOLOGY SESSION

MT.1: HEMOGLOBIN ELECTROPHORESIS AS A MASS SCREENING METHOD FOR DETECTION OF HEMOGLOBINOPATHIES. *Mahendra Singh*, Biology Department, Southern University, Baton Rouge, Louisiana 70813.

A comprehensive screening program for detection of abnormal hemoglobins includes a cellulose acetate electrophoresis procedure. The cost is determined to be \$.06 per test and uses hemolysates prepared from packed unwashed red blood cells. The method described can immediately distinguish sickle cell trait, sickle cell disease and sickle cell-hemoglobin C disease and is useful for clinical diagnosis and genetic counselling. In addition to sickle cell patients, the method can also detect patients with thalassemia minor, hereditary persistence of hemoglobin F and hemoglobin types like elevated A₂, C disease and others. This mass screening program also includes provision for follow-up laboratory studies such as quantitative electrophoresis, solubility tests and fetal hemoglobin assay to define more specifically the abnormalities detected.

MT.2: RADIOMETRIC METHOD FOR ANTIBIOTIC SUSCEPTIBILITY TESTING SUBSEQUENT TO DETECTION OF BACTERIURIA. *Gwendolyn Johnson* and L. S. Gall, Bennett College, Greensboro, North Carolina 27420.

The conventional method for the detection of bacteriuria and determination of antibiotic susceptibility requires approximately 48 hours. A more rapid method for determination of antibiotic susceptibility is being sought. Urine specimens determined to contain more than 10^5 organisms by a radiometric procedure are then tested by a similar procedure to determine antibiotic susceptibility. Urine is incubated at 37°C with a ¹⁴C-tagged glucose substrate and amino acid for 1-2 hours, and the radioactive CO₂ produced is measured in an ionization chamber. A reading of 6 or above within 2 hours is indicative of a bacteriuria. These urine samples were then tested immediately by the radiometric procedure for antibiotic susceptibility using tetracycline, ampicillin, and sulfonamide. The procedure is as follows: positive urine samples are diluted 1:10 or 1:100 depending upon their degree of positivity. Each diluted urine is placed in four vials, a control and three with antibiotics, a nutrient broth and a ¹⁴C-tagged substrate, incubated for 3/4 hour. Readings are taken from the control. If the control reads 20 or

more, all other vials are read. If the reading is less than 20, no other vials are read at that time and the test is returned to incubate for readings at 1 hour intervals until the control reaches 100. Then all tests are read and discarded. Results of over 50 tests indicated good agreement with the Kirby-Bauer with tetracycline and ampicillin, but not with sulfonamide.

MT.3:FLUORESCENT-DYE FOR THE DETECTION OF EARLY SIGNS OF DENTAL CARIES, *H. R. Rawls* and *W. D. Owen*, Gulf South Research Institute, New Orleans, La. 70186 and LSU School of Dentistry, New Orleans, La. 70119.

Existing clinical methods detect the presence of carious lesions only after irreversible damage has been done to the tooth. This paper presents a technique for detecting dental caries at its earliest stage where arrestive or curative procedures might be effective.

The development of microvoids is generally agreed to be the first change in the tooth's structure during the carious process. A technique known as the liquid-penetrant test has long been in use in industrial nondestructive testing for evaluating such defects. This technique makes use of a liquid which is very fluid and which strongly wets the surface of the material to be tested. Such a liquid can penetrate cracks and other surface imperfection.

Using both commercial formulations and formulations specifically designed for dentistry, enamel pits, fissures, cracks and white decalcified areas were found to be indicated by the technique. In addition, areas on extracted teeth which showed no conventional signs of defects were also indicated, and in each such case it was found that the microhardness of these areas was significantly lower than that of the surrounding enamel surfaces. Subsequent experiments showed that appropriate dye/penetrant formulations are strongly taken up at the site of artificially-induced lesions, but do not stain sound enamel.

PHARMACOLOGY SESSION

P. 1: IN VIVO STUDIES ON THE MYOMETRIAL MOTILITY OF DOGS, *O. P. Verma* and *G. A. Chibuzo*, School of Veterinary Medicine, Department of Anatomy, Tuskegee Institute, Alabama 36088.

The motility of the uterine horns of dogs was investigated by using sponge-tipped catheter technique. The exogenous administration of single estrogen injection followed by series of progesterone injections exhibited a higher activity as compared to the estrogen treated animals. Extremely weak and irregular activity was observed in ovariectomized animals while pregnant animals exhibited slow and weak contractions. The progesterone domination in the pregnant animals does not appear to be the cause of weak activity in this group. The intravenous administration of epinephrine and norepinephrine at dose levels of 25 and 40 micrograms produced a diphasic response in estrogen treated and pregnant animals causing a slight stimulatory response followed by a relaxation. The estrogen plus progesterone treated group exhibited an inconsistent response stimulating some uteri while relaxing the others; the ovariectomized animals had a relaxed uteri followed by a complete arrest of contractions. The effect of epinephrine and norepinephrine on uterine motility appeared to be modified by the sensitivity of the uterus to estrogen and progesterone.

Sectioning the hypogastric and pelvic nerves did not alter the frequency or the amplitude of uterine contractions. The role of uterine nerves in the reproductive processes other than the uterine motility is suggested.

P.2: DNA AS A COMMON DENOMINATOR FOR ENZYMES AND DRUG SENSITIVITIES IN CANCER OF THE COLON. *M. L. Guillory, L. E. Gillen, E. T. Kremenz, Jr., E. T. Kremenz, Sr. and L. R. Morgan, Jr.* Department of Pharmacology, L.S.U. Medical Center and Department of Surgery, Tulane University, Louisiana 70112.

Cancer cells have been shown to have varying amount of DNA as compared to that of normal tissue. In any unsynchronized population of cells that are rapidly replicating, the DNA content (haploid or diploid) would vary depending on the stage of the cell's cycle. The overall types of replication would be roughly estimated by total DNA per volume of wet weight.

Many attempts have been made to relate growth rates, degrees of malignancy, radiosensitivity and drug sensitivity of tumor tissue. As part of our interest in the sensitivity of various tumor enzymes to specific drugs we routinely measure and use tumor DNA as a common denominator. It is very useful where connective tissue may represent up to 90% of the wet weight (breast cancer) in contrast to colon where connective tissue accounts for only about 30% of the wet weight.

In our laboratory we have found that for normal human colon the

range of DNA is from 7 to 10 μg per 4 mg of wet weight. In contrast, DNA content for colon cancer (35 patients) is in the range of 9.6 to 73 μg per 4 mg wet weight with only two falling in the normal range.

We are routinely using DNA as a common denominator to correlate tumor enzymes that are involved in metastasis (arylsulfatase) and drug sensitivity (alkaline phosphatase, dihydrofolic acid reductase). The relationship between these enzymes, DNA and histology of human cancer of the colon will also be discussed.

P.3: A STUDY OF THE EFFECT OF SHAKING STRESS ON DIPHENYLHYDANTOIN PROTECTION USING ELECTROSHOCK IN MICE, *Jennifer C. Allen*, Sarahillie Hicks, Darrell Davidson, Floyd Domer, Department of Chemistry, Xavier University, New Orleans, La. 70125 and Department of Pharmacology, Tulane University School of Medicine, New Orleans, La. 70112.

It is well known that stressful situations result in an increased turnover of catecholamines in the brain. Associated with this stress induced change in metabolism there is likely to be an associated change in the rate of movement of substances between the blood and the brain. In order to investigate whether such a change in blood brain barrier permeability exists, protection of mice against electrically induced seizures using diphenylhydantoin was tried. Mice were given an interperitoneal injection of saline, or diphenylhydantoin 6, 8, or 10 milligrams per kilogram. Maximum electro shock seizures were induced during the subsequent 270 minutes. Half of the animals during this period of drug activity were shaken at a frequency of 3 per second. The onset and intensity of diphenylhydantoin - induced protection was greater in the shaken animals during the first hour following drug administration.

Supported by NIH Grant Number 1S06RR08008-01.

P.4: THE SYNTHESIS AND PHARMACOLOGY OF SOME STABLE ANALOGS OF ACETYLSECOHEMICHOLINIUM-3. *Arvind B. Rege* and *Vernon B. Haarstad*, Department of Pharmacology, Tulane University School of Medicine, New Orleans, La. 70112.

In order to find stable analogs of ACHC-3, that might have the ability to inhibit cholineacetylase, the acetylcholine moiety in ACHC-3 was replaced with Trimethylethoxyethylammonium, Trimethyl-5-(2-oxopentyl) Ammonium and Trimethyltentylammonium to give the Ether-, Keto- and

the Alkyl-analogs respectively. The Sulfur-analog was also prepared in view of the fact that the replacement of the ether oxygen with sulfur in acetylcholine affected the conformation and the depolarizing ability but not the ability of the molecule to be a substrate of acetylcholinesterase. The acute toxicity studies in mice showed that the Thio-analog was as toxic as ACHC-3 and the Ether-, Keto- and the Alkyl-analogs were less toxic, toxicity decreasing in that order. The protection against the toxicity was afforded by choline but not by neostigmine. The Thio- and the Ether-analog showed muscarinic activity whereas the Keto- and the Alkyl-analogs were almost devoid of it. Both the Thio- and the Ether-analog inhibited acetylcholine biosynthesis in the mouse brain-mince preparation, whereas the Keto-analog had no effect on acetylcholine biosynthesis. The Thio-analog showed the late phase (HC-3-like) neuromuscular block, reversible with choline, whereas the Ether-analog showed a mix-block, an early phase block (d-tubo-like) and the late phase block (HC-3-like), in the cat sciatic nerve gastrocnemius muscle preparation.

P.5: INTERACTION BETWEEN PENTOBARBITAL AND CORTISOL WITH REGARD TO THE INDUCTION OF TRYPTOPHAN PYRROLASE IN MOUSE AND RAT LIVERS, *I. S. Thandi* and D. Ghosh, Department of Biology, Texas Southern University, Houston, Texas 77004.

Experiments were conducted to establish time-effect relationships with regard to the level of hepatic, endogenous holotryptophan pyrrolase in male Swiss white mice (Stain CB-2) after single administrations of sodium pentobarbital (75 mg/kg = 303.0 μ moles of pentobarbital). The 12-hour, 10-hour, 8-hour, 6-hour and 4-hour effects were studied and these values were compared with saline-injected controls. Further, these studies were extended to fourteen chronic injections of the barbiturate (= 101.0 μ moles/kg/day) to rats followed by a single administration of hydrocortisone-semisuccinate (=70.0 μ moles/kg) and these results are compared with the corresponding controls, i.e. identical rats administered one saline injection for fourteen consecutive days, followed by a single administration of the steroid on the fifteenth day. The nature of interaction between the barbiturate and the steroid with respect to the active form of the enzyme and the possible significance of the results are discussed.

Supported by NIH Grant PR08061-01

P.6: PHARMACOLOGICAL ACTIVITY OF MYCOXIN FROM ASPERGILLUS SPECIES ISOLATED FROM HOUSTON SOIL, *Kenneth Sam, Pete Jones, Sunday Fadulu, and John J. Session, Department of Biology, Texas Southern University, Houston, Texas 77004.*

Samples of soil were collected in sterile test tubes from three selected areas in Houston. One ml. of the sample suspension was injected intraperitoneally into mice. The spleen, liver, kidneys, and brain of each mouse were collected, ground in sterile teflon tissue grinders. The ground tissues were inoculated into sabonraud agar plates. The plates were incubated at 25°C for three days. The mycelial mat with green conidia was removed aseptically, properly minced and subjected to ultra-sonic vibration. The liquid obtained was centrifuged. The endotoxin was injected both intravenously and intraperitoneally into frogs. The sciatic nerve was stimulated at the rate of one volt at a 2 m.-sec. duration. The result indicates that the endotoxin was able to depress the response to sciatic nerve external stimulus. The endotoxin is likely to act as a neuromuscular blocking substance possessing a cumulative effect. These findings have also shown that the endotoxin is depolarizing in action.

Supported by NIH Grant Number PR08061-01.

P.7: THE EFFECT OF NUMBER AND PROPORTION OF REINFORCEMENTS ON THREE MEASURES OF RESISTANCE TO EXTINCTION. *Ralph M. Chinn, Department of Psychology, Clark College, Atlanta, Ga. 30314.*

Fifty-four male albino rats were randomly assigned to the nine conditions of a 3 x 3 factorial design. The design consisted of three levels of two main variables. The variables were percentage of reinforcement-fixed ratio (FR) — 25%, 50%, and 100% — and number of reinforcements (NR) — 0, 20, 40. The primary interest in this study was to examine three extinction criteria. The three measures of extinction were (1) the total number of responses during a one hour period, (2) the number of responses made to a five minute period of no responding, and (3) the number of responses made during an extinction period comparable to each individual's acquisition period. The results demonstrated the usual partial reinforcement effect (PRE) in that NR and FR were statistically significant and independent. In no case was there any interaction between NR and FR. The results revealed the third extinction criterion to be the most sensitive measure of resistance to extinction. With further theoretical elaboration and replication, this third measure of resistance to extinction will be utilized in the investigation of drug effects on behavior.

SIMULATION AND INSTRUMENTATION

S.1: AN ELECTRONIC DATA ACQUISITION SYSTEM FOR BIOMEDICAL RESEARCH, *Darryl M. Washington*, Alex Jordan, Jr., Lee Williams, Jr., Electrical Engineering Department, North Carolina A&T State University, Greensboro, N.C. 27411.

Electrical engineering involvement in the MSBS Program is concerned with the application of modern electronic instrumentation and computer techniques in biomedically related research. The conceptual design of a multichannel electronic data acquisition system was developed by a MSBS principal investigator and graduate laboratory assistants in the Electrical Engineering Department. The system consists of electronic modules for signal conditioning, analog to digital conversion, a printer and an incremental data tape recorder. The tape recorder can record such physical variables as temperature, muscular tension, time, pH etc., at fast rates, e.g. 10 to 20 data points per second. After recording, the tape can be used to print out data in numerical hard copy form or used directly in a digital computer program thus eliminating laborious and time consuming manual data taking and card punching operations. The first phase of the system has been built with electronic components which are also used in an ongoing NASA research Project in Microelectronics, and is currently undergoing tests and evaluation. Because the system is portable it may conveniently be moved to various laboratory sites. This paper discusses the merits of the system and how it may be used effectively in biomedically related research.

S.2: THE CELL: AN ELECTRICAL MODEL, *Raymond S. Lieber*, 2d Lt USAF, 49th Civ Engrg Sq/DEI, Holloman AFB, NM 88330.

An RLC electrical model is proposed for the biological cell. It is argued that the resistance is small. This argument is based on considerations of cell physics and chemistry. The concept of a micro-current circuit is introduced and is related to the chemical reactions within the cell. These concepts are developed into the hypothesis that resonance frequencies can be found for each microcurrent circuit in the cell.

This hypothesis is further developed to include a possible relationship between electrical field strength and metabolic rate of a cell placed in an electromagnetic field oscillating at the cell's resonance frequency. These hypotheses are related to cancer research, studies in regeneration, and reconstruction of a living cell from its chemical constituents. Experiment

are discussed which are currently being pursued to discover whether the theory is accurate.

5.3: A COMPUTER SIMULATION OF IRRADIATION OF THE MOUSE THYMUS, *Judith Rae Lumb*, Biology Department, Atlanta University, Atlanta, Ga. 30314.

A computer simulation of the development of the normal thymus has been constructed. Further refinements of this model include the degeneration of the thymus in older animals, dependence of the stem cell division on population size, and environmental influences on the lymphocyte populations in the thymus. Irradiation of the thymus is simulated using values for fractions of cell populations killed by various doses of X-ray. The simulated thymus is then allowed to recover. Results follow very closely the laboratory data for such recovery. The ultimate goal of this work is to be able to test interrelationships between factors involved in leukemogenesis. Results obtained to date indicate that this is a feasible goal.

Supported by NIH Grant RR 8006.

5.4: SYSTEMS ANALYSIS AND THE RESEARCH COMPUTER PROGRAM. *James L. Schmit*, Department of Computer Science, Loyola University, New Orleans, La. 70118.

The ever increasing availability of high speed electronic computing equipment combined with a continual reduction in the cost of using such equipment has encouraged many scientists to construct computer programs as research tools. The purpose of this paper is to introduce some computer software design considerations that are usually overlooked by the scientist-programmer during the construction of his program systems. By incorporating these considerations in his program system, the researcher should not only extend the usefulness and versatility of his program but also reduce the time required to develop a functioning system.

Design topics discussed include how not to run out of memory, how to produce a program that can easily be converted to another computer, how to write a program so as to reduce debugging time, how to test a program, and how to document a programming system.

NOTES

DR. JULIAN

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GL 5-8700
VI 8-3234

sponsored by
XAVIER UNIVERSITY OF LOUISIANA
and
THE NATIONAL INSTITUTES OF HEALTH
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