

FIFTEENTH ANNUAL MEETING OF THE COLLEGIATE DIVISION
OF THE TENNESSEE ACADEMY OF SCIENCE

SATURDAY, NOVEMBER 28, 9:00 AM

Manning Hall, Memphis State University
Robert E. Martin, Chairman, Tennessee Polytechnic Institute

MATHEMATICS SECTION

Concerning Functional Conjugates. Alan R. Grisom, Tennessee Polytechnic Institute.

This paper shows a necessary and sufficient condition such that $f(z) = \bar{f}(z)$.

What Makes an Integral Transform Useful? John Wilkerson, Memphis State University.

If $f(a) = \int_{-\infty}^{\infty} f(x) \cdot K(a,x) dx$ is called the integral

transform of the function $f(x)$ by the kernel $K(a,x)$ if the integral is convergent.

By the very fact that it is an integral, an integral transform is a linear operator. This is an essential property if one is to use an integral transform to solve linear differential equations. The choice of limits is very important in dealing with applied problems. One method of extending the theory of integral transforms is to extend the theory to finite intervals. Another method of extending the theory is by choosing different kernels.

There are several limitations possessed by integral transforms. One of these is that a transform will not apply to all functions. For instance the Laplace transform is usually limited to functions that are sectionally continuous and of exponential order. Most transforms will work only on linear differential equations with constant coefficients. However many physical problems can be expressed in equations of this type. For example, switch-on phenomena in linear networks, problems of small vibrations, heat diffusion, potential theory, and electrical cables can be handled by transforms.

CHEMISTRY SECTION

Friedel-Crafts Isomerization of Xylenes Using $AlBu_3$ and HBr Catalysts. Riley C. Garner, Southwestern at Memphis.

The major purpose of this research was to develop a clearer understanding of the mechanism by which xylenes isomerize under Friedel-Crafts conditions. The procedure of this kinetic study consisted of running the reaction under controlled conditions, removing and washing samples at desired time intervals, and analyzing these samples on a gas chromatograph. Results of this project include the conclusion that the nitro-methane solvent has a negative catalytic effect on the reaction. Data obtained seem to support the formation of a complex between the H positive ion and nitromethane

solvent. HBr serves as a positive catalyst in the reaction by furnishing an added concentration of H positive ions. A temperature increase of 10° C seems to increase the reaction rate two-fold. Also the formation of trimethyls results from disproportionation in the reaction, and the mechanism for this formation seems to involve a first formed 1,2,4-trimethylbenzene going to 1,3,5-trimethylbenzene.

BIOLOGY SECTION

Preparation of Rat Intestine for Ion Transport Studies. Dan Monroe, Christian Brothers College.

Isolation and preparation of small intestine of the rat for study of heavy metal ion transport by everted intestinal loops are considered according to the method of L. H. Wilson and G. Wiseman. The intestine is trimmed of fat and connective tissue while the rat is under anaesthesia. Four consecutive segments from the junction of the duodenum and jejunum to the ileocecal valve are removed. Each is everted and tied to a syringe tip immersed in the medium. A positive-recording electrode is placed inside the syringe barrel containing 2 cc of the medium. The other electrode is placed in 800 ml of outside solution at 37°C. A Vibrating-Reed electrometer measures the d-c potential across the intestine, while the final ion-concentration is determined by flame spectrophotometry and radioisotope technique. A short discussion follows on the application of these techniques to the study of heavy metal ion transport across rat intestine.

*The Effect of Ribonucleic Acid, Deoxyribonucleic Acid, Folic Acid, and Some Essential Amino Acids on Embryonic Development of Chicks.** Mildred L. Guinn and William Darden, Tennessee Agricultural and Industrial State University.

Experiments were conducted to determine the effect of ribonucleic acid, deoxyribonucleic acid, folic acid, arginine, lysine, tryptophan, and methionine on the development of chick embryos.

The eggs were selected on the basis of weight, internal and external defects, and cleaned with 70% ethanol. They were punctured with a sterile egg puncher; and the chemicals were injected into the albumin with a number 22 or number 27 hypodermic needle, attached to a 1 cc tuberculin syringe.

In Experiment I the eggs were injected with .05 cc of each of the protein solutions prior to incubation. In Experiment II, Series I, the eggs were injected with .05 cc of each of the 2 mg/cc protein solutions and in

Series II, .05 cc of each of the 20 mcg/cc protein solutions after seventeen (17) hours of incubation.

All treated groups, when compared with the controls, showed disintegration of the embryos, growth retardation, yolk material breakdown, and hemorrhages in the head, body, and tail regions.

*This investigation was supported by the Undergraduate Research Participant Program Research Grant GE-40100, National Science Foundation.

*Sensory Hairs in *Antrozus Pallidus*.* Marion Garrett, Siena College.

Sensory hairs, located on the face and chin of the bat *Antrozus pallidus*, are described. A microscopic study shows that the follicles of these hairs are suspended by a number of connective tissue strands in a vesicle containing blood. The outer part of the hair follicle, the connective tissue strands and the walls of the vesicle are richly supplied with nerve fibers. The sensory hairs vibrate freely and may play a part in echolocation.

BOTANY SECTION

Species Determination through Leaf Characteristics. Brother Lawrence Spirek, Christian Brothers College.

Leaves are the most readily available source of identification for trees since they are normally present much longer than flowers or fruit. In closely allied species in which differences may be minimal, it is helpful to find "key" diagnostic features to distinguish them by leaf characters alone. In the genus *Ulmus*, some species are very similar. This study involves one individual each of *U. americana* L. and *U. serotina* Sarg. Leaf shape, size, venation, texture, and color are factors considered, including measurements of length width, and length/width ratio.

*The Use of Piperazine Monohydrochloride as a Treatment for *Capillaria Columbae* in Pigeons.* Wallace Davis III, Tennessee Polytechnic Institute.

In an effort to prove that piperazine may be used as a treatment for *Capillaria columbae* in pigeons, the effects of piperazine-as the monohydrochloride-were studied on fifty pigeons. The results of the experiment indicate that the cure is at least 95% effective.

Advantages of the Summer Student Program at Redstone Arsenal. Ronnie Miller, Austin Peay State College.

NEW MEMBERS OF THE TENNESSEE ACADEMY OF SCIENCE, 1964

- Adams, Dr. Ozie L. (Zoology), Animal Science Dept., Tenn. A and I State Univ., Nashville, Tenn.
- Aubry, Alfred J. (Geology-Geography), 1725 Simpkins St., Nashville, Tenn.
- Baird, Dr. Irwin L., Ana. Dept., Univ. of Tenn. Med. Units, 62 South Dunlap, Memphis, Tenn.
- Beatley, Dr. Janice C. (Botany), Lab. of Nuclear Med. & Rad. Biol., 900 Veteran Ave., Los Angeles, Calif.
- Bell, Dr. Sandra (Botany), Univ. of Tenn., Knoxville, Tenn.
- Bergquist, Eugene T. (Botany), 700 Jonathan Ave., Knoxville, Tenn.
- Black, Harvey Dalano, Biology Dept., Memphis State Univ., Memphis, Tenn.

The objectives of the Summer Student Program are stated, and the means of achieving these objectives are discussed in terms of the specific activities of the 1964 program. Consideration is given to the facilities of both the Army Missile Command and the Marshall Space Flight Center, with emphasis on the overall picture of the unclassified work being done at Redstone. Some discussion of work in Systems Integration is given, plus a limited description of certain laboratories and test facilities. Ways in which the student and his employer may expect to benefit from the Summer Student Program are presented.

Seeing with Sound. Larry D. Flatt, Tennessee Polytechnic Institute.

An experiment was set up to test the theory that it is through Frequency Modulation that a bat is able to recognize his own signal.

A tape recorder, a specially constructed amplifier, a movie camera, and an oscilloscope were used in the experiment. The bats were released in a room in which six different wire mazes had been set up. As the bats approached the mazes, a motion picture was made and was synchronized with a tape recording of the audible bat signals. Pictures were taken also of the waves on the oscilloscope. The bats' signals we made audible through the use of the specially constructed amplifier.

After studying the collected data, the following statements could be made. The carrier wave of the FM signal of each bat has a slight variance from any other signal around him. Even if the bats were on the same frequency the difference in the carrier wave, no matter how minute, would be enough to distinguish each bat's signal from that of another.

IBM 1620 Computer Program for Atmospheric Properties. J. M. Roe, Austin Peay State College.

A report on a specific summer student project at Redstone Arsenal. Details of writing a computer program in Fortran for atmospheric properties as a function of altitude are discussed. The relationships among pressure, temperature, density, molecular weight, viscosity, speed of sound, Reynolds number, acceleration due to gravity, geopotential and geometric altitude are presented.

- Callis, Charles P. (Physics-Astronomy), 111 Edgewood, Martin, Tenn.
- Carter, Jordon F. (Science-Mathematics), Route 1, Delano, Tenn.
- Chandler, William A. (Chemistry-Physics), 4184 Graceland Drive, Whitehaven, Tenn.
- Conn, William T., Jr. (Biology), 4969 Shifri, Memphis, Tenn.
- Cooper, David P. (Zoology), 305 Peach Bloom Dr., Chattanooga, Tenn.
- Davis, Dr. James H. (Geology-Geography), TVA, Mineral Res. Sec., Geologic Br., Union Bldg., Knoxville, Tenn.
- Davis, Milton (Chemistry), 513 So. Liberty St., Jackson, Tenn.

(Continued on Page 75)