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ARKANSAS ACADEMY OF SCIENCE

ABSTRACTS OF PAPERS PRESENTED  
AT THE THIRTY-SEVENTH ANNUAL MEETING

The College of the Ozarks, Clarksville  
April 24-25, 1953

BIOLOGY SECTION

Chairman: R. S. Fairchild, University of Arkansas

B-1-1

An Apparatus for the Quantitative and Qualitative Control of Gases in Pure Culture. Delbert Swartz, University of Arkansas.

A system of filters and gas washing bottles has been used successfully to control certain gaseous components of air passed through pure cultures of fungi being used in studies of the production of available nitrogen.

B-5-5

The Biosynthesis of Some Relatively Complex Organic Compounds by Certain Molds. George Thomas Joynson, University of Arkansas.

The imperfect fungi are suited admirably to the study of synthetic reactions in the intact organism because they will grow on simple carbohydrates, such as those with glucose as the sole carbon source. Included in this paper are some case histories containing suggestions of the general pathway involved in relatively complex biosyntheses.

B-9-9

Preliminary Study of Trace Mineral Deficiencies in Arkansas. Paul R. Noland, University of Arkansas.

A factorial experiment was designed to study the possible need of the trace minerals, cobalt and copper, in growing and fattening swine. Pigs with an average initial weight of 39 pounds were fed to a final weight of about 100 pounds. The feed consisted of a practical drylot ration containing corn, soybean meal, calcium and phosphorus supplements, B-vitamins, and vitamins A and D. This ration was supplemented with 0.6 mgm. of cobalt per pound of feed, 0.6 mgm. of copper per pound of feed, and a combination of 0.6 mgm. of cobalt and 0.6 mgm. of copper per pound of feed. The average daily gains and the feed required for each 100 pounds of gain for the four treatment groups were: basal, 1.23 and 376 pounds; cobalt, 1.31 and 322 pounds; copper, 1.30 and 377 pounds; and cobalt and copper combined, 1.40 and 303 pounds. The differences between the treated and untreated groups approached significance at the five per cent level of probability.

B-15-15

Red Clover Hay vs. Korean Lespedeza Hay for Wintering Dairy Heifers. Charles T. Hickman, L. Ratcliff, and O. T. Stallcup, University of Arkansas.

Red clover hay was compared to Korean lespedeza hay during a 77-day feeding trial. Two groups, each composed of eight dairy heifers (Holsteins and Jerseys), received identical treatment through the experiment, except for the type of roughage fed ad lib. Each heifer was paired with a heifer from the other group. The couples were approximately the same age, weight, and breed. The heifers receiving the red clover hay consumed an average of 16.2 pounds a day per animal. The group fed Korean lespedeza hay consumed an average of 17.26 pounds a day per animal. The average weights gained per day per animal were 1.20 pounds for those fed red clover hay and 1.23 pounds for those fed Korean lespedeza hay. The heifers fed on red clover hay consumed an average of 13.65 pounds to gain one pound; the heifers fed on Korean lespedeza hay consumed an average of 14.05 pounds to gain one pound.

## CHEMISTRY SECTION

Chairman: W. K. Noyce, University of Arkansas

C-1-20

Making Organic Functional Groups Forceful and Vital. Jean Williams, Arkansas State Teachers College.

This paper is an attempt to show how to put life and meaning into seemingly dead diagrams by vitalizing the functional groups. A vivid and forceful picture of magnetic fields and dynamic action taking place under definite scientific laws is given the student, who thinks of force and action in relation to another stronger or weaker force. The structural formula must cease to be merely bonds with atoms arranged in a definite pattern. By discussing processes in this manner, the student is able to memorize formulae from the standpoint of objects in action. The functional groups are the active units, they are the soldiers in the field.

C-2-21

Consideration of Cation Exchange Equilibria. James L. Pauley, University of Arkansas.

It has long been known that the affinity of cation exchange resins for various cations differs in general according to the lyotropic series, such as Cs Rb K Na Li and Ba Sr Ca Mg for aqueous solutions at moderate concentrations. This series is also the order of increasing hydrated ionic radii, such as Li Na K Rb Cs, etc. Many mechanisms have been proposed to explain this selectivity, but no satisfactory mechanism has been developed. This paper offers an explanation of this selectivity based on a consideration of the coulombic forces acting on the system. Consider the resin as a series of negative point charges distributed at random throughout the resin, with the cations held at an average at their closest distance of approach which may be considered to be the sum of the hydrated radii of the "absorbed" cation and the resin anion. The free energy change involved in the exchange of the cations, and thus  $K_{eq}$ , may be determined then from the work necessary to remove each of the two types of cations involved from this distance of closest approach to infinity against the coulombic attractive forces acting between the cation and the resin anion. Calculations have been made for several ions for a particular resin for several uni-univalent exchanges and one uni-divalent exchange, and the calculated  $K_{eq}$  was found to agree quite well with that obtained experimentally.

C-3-22

Some Aspects of the Hot Atom Chemistry of Bromine. T. C. Hoering, University of Arkansas.

Much information exists on the chemical effects of neutron capture of bromine in organic bromides. Less information is available on inorganic compounds of bromine. Experiments have been performed to determine the chemical effects on bromates of three nuclear processes--(1) neutron capture by  $Br^{79}$  to give the lower (18-minute) state of  $Br^{80}$ , (2) neutron capture by  $Br^{79}$  to give the upper (4.4-hour) state of  $Br^{80}$ , (3) isomeric transmission of  $Br^{80}$ . The results of process (1) indicate that the retention in neutral solutions of bromates is about two per cent. The retention increased greatly as the pH is lowered, and it increases slightly at high pH. The retention in neutral solutions following processes (2) and (3) is about 35 per cent.

C-4-23

The Vapor Pressure of Saturated Solutions of Some Lithium Salts. Hyman Chessin, University of Arkansas.

The vapor pressure of saturated solutions of several lithium salts was determined at 20°C, 40°C, and 60°C with a differential tensimeter. Such saturated solutions maintain constant humidity conditions in enclosed chambers. These humidity conditions are independent of small temperature fluctuations. Because of their high solubilities, the lithium salts are particularly valuable for the production of low relative humidities.

C-5-24

Influence of High School Mathematics on Grades in General Chemistry at State College. R. H. Austin, Arkansas State College.

Grades in the first semester of general chemistry at Arkansas State College are higher among students who had one year of algebra and one year of plane geometry in high school. A second year of algebra, however, did not appear as beneficial to the chemistry student as a year of plane geometry after the first year of algebra. Solid geometry did not seem to help chemistry grades of the students.

C-6-25

Instrumentology: A New Division of the Physical Sciences. Edward S. Amis, University of Arkansas.

Instrumentology deals with theories of the design, maintenance, and use of instruments in physical sciences, and the interpretation and application of data obtained by instrumental methods of measurement. Instrumentology includes both instruments for control and for measuring. The importance of instrumentology is demonstrated by the fact that in 1952 two billion dollars were spent to purchase equipment for instrumental control and measurement. Equations previously considered insolvable have been solved by means of mechanical calculators and calculators making use of multiple banks of electron tubes and by means of differential analyzers. The atomic energy program has encouraged improvement of instruments used in control, testing, measurement, and calculation.

## PHYSICS SECTION

Chairman: N. F. Bolling, Arkansas State Teachers College

P-4-38

Heat Transmission Through Fabrics as a Function of Thickness and Density of Packing. Robert J. Heaston, University of Arkansas.

Thermal conductivity data invariably are given in literature without specifying how, or under what conditions, the data were obtained. A review of the literature also revealed that there were several methods of obtaining thermal conductivity data. From these, the Cenco-Fitch method was chosen for research on the thermal conductivity of thin (0.0085 to 0.328 inches thick), circular samples of different fabrics and quilted batts of fibrous materials. The substances tested included cork, orlon, vinyon HH, wool felt, chamois leather, cotton, and various combinations of fibers. An attempt was made to correlate thermal conductivity as a function of thickness and density at a constant pressure of 1.437 psi. The value of  $k$  was found to increase first with an increase in thickness. With further increase of thickness, the value of  $k$  levelled off and then decreased with increasing thickness. With an increasing density, the thermal conductivity decreased, but there was also an optimum point where the value of  $k$  changed and increased with an increased density. With a high moisture content, the thermal conductivity increased seven or eight times in value.

SOCIOLOGY SECTION

Chairman: Norman E. Washburne, Southern State College

S-1-42

The Role of Religion in Crow Indian Culture and Society. Fred W. Voget, University of Arkansas.

Warfare--the primary institutionalized pattern of Crow culture--idealized the courageous and daring person who raided the enemy. Considered from a socio-psychological viewpoint, the primary role definition emphasized a maximizing of the social self in competition with others. It guaranteed the person a high degree of autonomy in motivation. The source for the autonomy of the social self is found in the primary support pattern--religion--for a Crow based his action on a prophetic intelligence derived from the supernatural. Considered psychologically, Crow religion contributed a basic security to the believer and tended to reduce anxiety in situations beyond the control of the individual. When analyzed in terms of ends, roles, and content, the religious pattern shows significant congruencies with the primary institutionalized pattern.

S-3-44

The Spiritualists: Described and Analyzed for Their Sociological Significance. J. Edward Blackwell, Grambling State College.

Spiritualism can be defined as a system of professed communication with departed spirits or the unseen world, chiefly through individuals who possess special endowments for such communications. Spiritualism includes three distinct categories: modern spiritualism, which includes such mental phenomena as mental telepathy, clairvoyance, premonition, and telekinisis; divine spiritualism, which includes a mixture of the elements of many major religious faiths, systematized into one organization based on "divine intervention" in the lives of the living and the spirits of the dead; and voodooism, a witchcraft that deals with evil spirits that may be combated and appeased by charms, rituals, and incantations.