KANSAS CITY MEETING OF THE AMERICAN CHEMICAL SOCIETY

The fifty-fourth meeting of the American Chemical Society was held at Hotel Muehleback, Kansas City, Kansas, from April 10 to April 14, 1917. The general program was carried out under the able leadership of Professor Julius Stieglitz, president of the society, and Dr. Charles L. Parsons, secretary, while the various divisions were presided over by Charles L. Alsberg, E. H. S. Bailey, J. E. Breckinridge, J. R. Bailey, H. E. Howe, H. P. Talbot, L. F. Kebler and T. J. Bryan.

During the session the usual order of business was carried out, consisting of meetings of the council, inspection of plants, with general and public sessions. A complimentary smoker and subscription banquet added to the diversion of the week.

On Wednesday morning, April 11, addresses of welcome were given by Hon. George H. Edwards, mayor of Kansas City, and by Dr. Frank Strong, chancellor of the University of Kansas. Response to these addresses was made by President Julius Stieglitz. Mr. Arthur J. Boynton gave a very interesting paper on the Economic resources of the Kansas City zone.

Wednesday afternoon was given over to a public session, of which the program was as follows:

PETROLEUM AND NATURAL GAS

H. P. Cady, *Chairman*

The geology of the mid-continent oil and gas fields: Raymond C. Moore.

Variations in the composition of gases of the mid-continent field: H. C. Allen and E. E. Lyder.

Helium and associated elements in Kansas natural gases: C. W. Seibel.

Some experiences in the use of oxy-acteylene welding in long distance natural gas transportation: E. P. Fisher.

The cracking of petroleum in the liquid phase: Roy Cross.

One billion gallons of synthetic gasolene in 1918: Walter F. Rittman.

The chemical work of the petroleum division of the Bureau of Mines: Harry H. Hill.

Thursday morning was given over to a symposium on the chemistry and metallurgy of zinc, Professor John Johnson presiding. The remainder of the day and Friday were occupied with the meetings of the divisions.

The following abstracts of papers presented have been prepared by the authors for publication in Science:

DIVISION OF BIOLOGICAL CHEMISTRY

C. L. Alsberg, *Chairman*

I. K. Phelps, *Secretary*

The toxicity of galactose and mannose for green plants and the antagonistic action of other sugars toward these: Lewis Knudson. The toxicity of galactose to the growth of *Pisum arvense* L. and to *Triticum sativum* L. was inhibited by glucose or saccharose, the former being slightly more effective than the latter. But levulose, arabinose, maltose and raffinose do not inhibit the toxicity of galactose, although in presence of levulose the primary root may continue its growth to a limited extent It was found that 0.0125 mol. galactose was as toxic as 0.025 mol, the other sugars being used at a concentration of 0.025. Mannose had a toxic effect similar to galactose. Glucose or saccharose inhibited the toxicity of mannose.

The effect of three annual applications of boron on wheat: F. C. Cook and J. B. Wilson. Borax and colemanite were applied to horse manure in amounts sufficient to act as a fly larvicide. The manure was applied to the same plats at the rate of 20 tons per acre for three consecutive years and wheat was grown on the plats each year at Arlington, Va. A borax, a colemanite, a manured control and an unmanured control plat were used. It is calculated that the upper 6 inches of soil of the borax plat received .0088 per cent. H_3BO_3 the first year and .0022 per cent. the second and third years. The colemanite plat likewise received .0029 per cent. H_3BO_3. Borax reduced the yield of grain 10 per cent. in 1914 and 1915, colemanite had little effect. In 1916 the yields from all four plats were low, but the borax plat gave the largest yield. The only apparent injury to the wheat was the first season on the plat receiving the large amount of borax. There were no evidences of any cumulative action of boron in the soil.

The after-ripening of fruits: F. W. Muncie and W. P. James, Illinois Agricultural Experiment Station, Department of Horticulture. Attempts to preserve peaches by encasing with hard paraffin were unsuccessful, since considerable decomposition resulted after two months, with a marked production of alcohol and an intensely bitter taste. The color, however, remained normal, and the skeleton of the fruit was not broken down. This last condition is similar to that described for other fruits kept in an atmosphere of CO_2 by other workers and is apparently due to an accumulation of carbon dioxide within and about the fruit.

Peaches decomposed rapidly about the spot where an injection of invertase had been made, or in a solution of invertase. Similar experiments are in progress with apples, in an effort to explain the discrepancy between the decrease in sucrose content of apples during ripening found by Bigelow, Gore and Howard and the absence of invertase from the apples studied by Thatcher. Flesh and epidermis of peaches kept in an atmosphere of O_2 for two months became golden yellow, but turned brown quickly on exposure to air. The flesh was soft, contained a little alcohol, and had an insipid taste. Quantitative study of the respiration of apples in an atmosphere of oxygen, showed that the rate is higher under this condition than in an atmosphere of air.

Quantitative determination of carbohydrates in plant tissues: F. W. MUNCIE and D. T. ENGLIS. If fresh plant tissue is plunged into warm alcohol and after standing two weeks, the alcohol removed by decantation and expression before extraction with hot alcohol, a large percentage of the sugar (96 per cent. in one experiment) is removed and loss of fructose by hot extraction largely avoided. Mercuric nitrate is more satisfactory to use than the acetate and 10 per cent. phosphotungstic acid than the more concentrated solution used by them. Asparagin also is quantitatively removed from solution by mercuric nitrate provided the solution is made just alkaline to litmus with sodium hydroxide or carbonate after addition of the mercuric salt, then just acid with a few drops of weak acid. No mercuric oxide is precipitated by such a procedure. These reagents, especially the phosphotungstic acid, invert sucrose so quickly that they are not applicable to the determination of a mixture of sucrose, glucose and fructose, excepting when sucrose has been previously determined. This may be done by using basic lead acetate as the clearing agent, by the polarimetric method if the inversion is made with invertase or solution again made neutral after use of acid. When the value for sucrose is known, the original solution partially cleared with SO_4-free alumina cream is inverted with invertase, then nitrogenous impurities removed with mercuric nitrate and phosphotungstic acid and total glucose and fructose determined. Subtraction of value for sucrose leaves the values for glucose and fructose present in the original solution.

A physical and chemical study of the kafir kernel: GEORGE L. BIDWELL. Dwarf, black-hulled, white kafir kernels were separated by hand into bran, germ and endosperm. These parts were analyzed and compared to corresponding parts of corn and were found to resemble them closely. In the bran a wax-like substance was found. The ether extract of the germ was found to be liquid. The endosperm yielded an ether extract not yet examined. The coloring matter in this sample does not seem to be associated with tannin. The endosperm may be separated into starchy and horny parts, the former having less protein than the latter.

Oil from the avocado: H. S. BAILEY and L. B. BURNETT. The production of the avocado or alligator pear in the United States is increasing so rapidly that there is a possibility of large quantities of this fruit being available as a source of oil. The fruit when fully ripe contains approximately 80 per cent. of moisture and the dried material about 50 per cent. of oil. So far no method has been found by which the oil can be extracted from the fruit in a sweet, edible condition, and as the oil when extracted with ether and the solvent removed at low temperature in vacuum has a bitter taste, it is very doubtful whether the oil as it exists in the fresh fruit itself is palatable if separated from the accompanying pulp. By means of the usual hydrogenation process it is comparatively easy to convert either the expressed oil or that extracted by solvents into a solid, white, tasteless, fat which resembles in its physical properties ordinary hydrogenated cottonseed oil.

Oil from the Stillingia sebefera: H. S. BAILEY and L. B. BURNETT. The fruit of the semi-tropical tree *Stillingia sebefera,* which grows in China and has been introduced into some of the southern states of this country, produces two glycerides. The exterior of the seed is covered with a wax-like substance from which is derived the Chinese vegetable tallow of commerce. The interior of the seed contains an oil usually known as stillingia oil. Certain statements in the literature indicate that this oil even in China is not used for food purposes and probably has poisonous properties. The constants of these oils have been determined, and experiments made by Dr. William Salant, of the Bureau of Chemistry, in feeding rabbits with both the expressed and extracted oils. So far as the results obtained with the small amount of material available are conclusive, it appears that stillingia oil is not toxic and has practically the same effect as other vegetable oils.

A noteworthy effect of bromides upon the action of malt amylase: ARTHUR W. THOMAS. The action of sodium and potassium bromide upon malt amylase was found to be inhibitory when present

in small amounts, but when these salts were present in greater concentration an activating action was obtained. This action was found when highly purified Lintner soluble starch and thrice repurified bromides were used.

Availability of the energy of food for growth: C. Robert Moulton, Missouri Agricultural Experiment Station. Three beef steers were subjected to digestion trials and maintenance trials. One was slaughtered as a check. The other two were fattened, one to full prime condition and the other to forty or fifty days under prime. All were analyzed. From the analysis the composition of the animals was determined and the composition of the gain. From the feed records and analyses the nutrients consumed above maintenance were determined. The energy equivalent of the flesh gained and of the feed consumed above maintenance was calculated. The two fattened steers saved in flesh gained 53.39 and 52.49 per cent. of the metabolizable energy consumed above maintenance. For similar conditions and a similar ration Armsby shows about 55 per cent. availability. This is an experimental verification of his calorimetric work.

Investigation of the Kjeldahl method for determining nitrogen; the influence of reagents and apparatus on accuracy: I. K. Phelps and H. W. Daudt. As a result of many experiments the conclusion was reached that in all routine work involving determinations by the Kjeldahl method it is necessary to deduct from the result obtained the amount corresponding to the nitrogen contributed by reagents and apparatus in use in the particular experiments. It is obvious that under less carefully controlled conditions in routine work the errors, which are here called inappreciable, will become large enough to seriously effect the accuracy of the results obtained.

A study of the estimation of fat in condensed milk and milk powder: C. H. Biesterfeld and O. L. Evenson. The Roese-Gottlieb method as applied to condensed milk and milk powder gives low results, the average error in the case of condensed milk being 0.04 per cent. The residual fat is obtained by treating the liquid left after three extractions by the Roese-Gottlieb procedure with acetic acid, heating and reextracting with ethyl and petroleum ethers. A method also is described which permits the recovery and repeated use of the solvents.

The Schneyer method for the determination of lactic acid in urine: Mary E. Maver. The Schneyer method for the quantitative determination of lactic acid in urine is not applicable, particularly under pathological conditions. The method is based on the production of CO when the ether extract of urine is treated with H_2SO_4. Hippuric acid is present in the ether extract and does yield CO. Other substances yielding CO, such as oxalic and citric acid, do not enter the ether extract by this method. Citric acid is present in normal urine. The method is of unquestionable value in indicating the excretion of substances under pathological conditions which belong to a group of substances capable of yielding CO under the conditions of the experiment.

On the optimum reaction for tryptic proteolysis: J. H. Long and Mary Hull. It has generally been assumed that tryptic digestion is possible in a neutral or slightly alkaline medium only, but some recent investigations suggest that these limits are too narrow. Employing fibrin as a substrate, the authors have found the optimum point at a hydrogen ion concentration between 10^{-8} and 5×10^{-9}, which is in agreement with the results of Michaelis and Davidsohn for a fibrin peptone substrate. The authors have found, however, that for casein as a substrate the optimum point is distinctly higher, and within the limits 3×10^{-6} and 5×10^{-7}. It is probable that for each type of protein there is a distinct range for the optimum activity and that casein may not be the only protein which is changed readily on the acid side of neutrality. Investigations on other proteins are in progress.

On the normal reaction of the intestinal tract: J. H. Long and Frederick Fenger. Employing the electrometric method of estimation the authors have studied the reaction of the small intestines of a number of animals and also of man. Misled by the false interpretation of the results of indicator tests certain writers have reached wrong conclusions regarding the normal or usual reaction between the pylorus and the lower end of the ileum. In the case of animals the whole intestine has been removed immediately after death, tied into three loops and each loop investigated separately. In some cases the reaction has been found to be acid throughout and from 1 to 3×10^{-7}. Alkaline reaction seems to be less common than acid, and far from the strength once assumed for the duodenum with its alkaline "zone." In the human subject material has been secured from points well below the duodenum by aid of Rehfuss tubes. An acid reaction is frequently noted here and persisting more frequently than the temporary alkalinity following the entrance of bile and the pancreatic fluids

Studies of the gastric residuum. No. III. The relation of total phosphorus to acidity: CHESTER C. FOWLER, Iowa State College. In view of recent support of a modification of Maley's hypothesis concerning gastric hydrochloric acid formation and a suggestion of approximate proportionality which might be expected to occur between the acidity of the juice and its acid calcium phosphate, it seemed desirable to study phosphorus and phosphorus partition of the gastric residuum. Thus fifty-two samples from apparently normal women were obtained and individually analyzed for total phosphorus. The conclusions follow: (1) Total phosphorus was not proportional to total or free acidity. (2) The minimum P_2O_5 content was 6.48 mgr. per 100 c.c. and the maximum was 30.03 mgr. (3) About 58 per cent. of the samples fell within the range P_2O_5 equivalent to 12–18 mgr., while about 21 per cent. lie above and 21 per cent. below these values. (4) A tendency toward a constant P_2O_5 content was shown in individuals who were examined more than once. (5) The average P_2O_5 content was 15.66 mgr. In a previous investigation made upon a composite residuum sample obtained from seventy men, a value of 12.16 mgr of P_2O_5 per 100 c.c. of residuum was obtained.

The utilization of carbohydrate on a relatively high and low cereal diet: ZELMA ZENTMIRE and CHESTER C. FOWLER. The object of the study was to determine any differences in the utilization of cereal protein and carbohydrate in thoroughly cooked cream of wheat when ingested in varying amounts. The data on protein utilization will be presented in a later paper. The experiment was divided into two periods of five days each with relatively high and low amounts of cereal in the diet; and two periods of two days each of nitrogen-free diet of relatively low and high starch content. Casein and milk were added to the cereal diets and butter fat and sucrose to all diets. Foods and feces were weighed and analyzed. The *total* carbohydrate utilization for each of the four periods was over 99 per cent. If the utilization of sucrose and milk sugar is taken as 100 per cent., the utilization of the starch and cereal carbohydrate is about 98 per cent.

The nature of the inosite phosphoric acids of some important feeding materials: J. B. RATHER, Arkansas Agricultural Experiment Station. An inosite phosphoric acid has been separated from wheat bran corresponding in composition to the formula $C_{12}H_{41}O_{42}P_9$, the formula previously proposed for this substance by the writer. It corresponds equally as well to the formula

$$C_6H_6(OH)(H_2PO_4)_6,$$

inosite pentaphosphoric acid. The latter formula, almost exactly one half of the first formula, and that of a theoretically possible compound is adopted as the more desirable. The principal inosite phosphoric acid of a sample of corn was found to be inosite pentaphosphoric acid, and neither inosite hexaphosphoric acid, nor the acid $C_2H_8P_2O_9$. The principal organic phosphoric acid of a sample of kafir corn was found to be inosite pentaphosphoric acid.

The formation of ester hydrolyzing substances by the action of alkali on casein: FLORENCE HULTON FRANKEL. Harriman Research Laboratory, Roosevelt Hospital, New York. The action of alkali on casein causes the formation of ester hydrolyzing substances, the formation of which is practically independent of the concentration of alkali, time of standing and temperature of standing. The substance is more active in very slightly alkaline solution (10^{-8}–10^{-10}) and loses a part of its activity on boiling. It can be entirely removed by long dialyzing. The action was tried on various esters.

Factors influencing the proteolytic activity of papain: EDWARD M. FRANKEL. Papain may be purified by precipitation from aqueous solution with acetone or ethyl alcohol. The ferment is inactivated by acids and alkalis in concentrations from 0.02 normal upwards. The enzyme is active between hydrogen ion concentrations 10^{-2} and 10^{-9}, the optimum being at 10^{-5}, calorimetric standards being used throughout. The quantitative relations of the enzyme and substrate have a marked effect on the extent of proteolysis, increasing quantities of either component causing an increase up to a certain point after which further additions have little effect. In the presence of HCN the proteolytic activity of papain is largely increased the same general relations between enzyme and substrate holding. Increasing the amount of HCN causes increased proteolysis up to a certain point, after which further addition caused no marked change. The same hydrogen ion optimum holds for papain in the presence of HCN as in its absence. HCN will cause further proteolysis in enzyme substrate mixtures that are apparently in equilibrium.

Variations in the chemical composition of alfalfa at different stages of growth: H. S. GRINDLEY and H. C. ECKSTEIN. In connection with investigations which the Illinois Experiment Station is ma-

king to determine the value of forage crops for the growth of farm animals, it became necessary to make complete chemical analyses of young growing grasses and legumes. The first young forage crop to study was that of alfalfa. The work includes the determination of the approximate composition, the forms of non-protein nitrogen, and the forms of protein nitrogen in the grasses and legumes. The results so far obtained with alfalfa lead in general to the following conclusions: First, that young alfalfa is very rich in crude protein; second, that as alfalfa grows older, there is a marked increase in the percentage of nitrogen free extract and crude fiber and a marked decrease in the crude protein of the water-free substance of the plant; third, it seems probable that the marked efficiency of young growing pasture grasses is due (*a*) to their high content of crude protein (*b*) to their high content of mineral constituents and (*c*) to the low content of crude fiber.

Physical and chemical constants of some American tomato seed oils: H. S. Bailey and L. B. Burnett. A number of tomato-seed oils have been made from seeds collected at various tomato pulp factories in Indiana and Maryland and the physical and chemical constants of these oils and their fatty acids determined. One point of particular interest in connection with the tomato-seed oil is that it gives a positive test for peanut oil by the Renard test. If sufficient care, however, is taken in determining the melting point of the final crystalline acids it will be found that they are higher than 72° C., which is usually accepted as the proper temperature for arachidic acid obtained in this method. The analysis of the methyl esters of tomato seed oil and of the saturated fatty acids obtained by the lead-salt-ether method from tomato-seed oil have been made.

A laboratory method for the hydrogenation of oils: L. B. Burnett and H. S. Bailey. A method of preparing a nickel catalyzer, suitable for the hardening of vegetable oils on a small scale in the laboratory, was described.

Electrically heated melting point apparatus: H. S. Bailey. A form of melting point apparatus heated by the passage of an electric current through a bath of dilute sulphuric acid, was described. The resistance of the solution to the passage of the current produces the heat, the increase in which may be regulated by adjustment of the distance between the poles.

The alkaloids of Bocconia frutescens: Emerson R. Miller. In 1895 Battandier examined the bark of *Bocconia frutescens* and reported the presence of fumarine (protopine), bocconine, chelerythrine and traces of an alkaloid giving reactions similar to those of cheliodonine. Bocconine, according to Schlotterbeck, is identical with β-homochelidonine. The writer separated from the leaves of the above-named plant protopine, chelerythrine, β-homochelidonine and γ-homochelidonine. The indications are that the bark contains sanguinarine in addition to the alkaloids reported by Battandier.

On the presence of free hydrocyanic acid in cassava: Emerson R. Miller. Some experiments carried out by the writer while connected with the Cuban Experiment Station show that most of the hydrocyanic acid contained in the roots of *Manihot utilissima* is present, combined as a cyanogenetic glucoside.

The effect of feeding acids upon the growth of swine: A. R. Lamb and John M. Evvard. Although the power to use ammonia produced in the body tissues for the neutralization of acids is known to be possessed by animals, the practical question of the effect of acid-feeding upon growth has not been investigated. Inasmuch as silage contains organic acids in considerable amount and the mineral content of many feeding-stuffs is strongly acid in character, this question is important. Eight pigs, divided into 4 lots, were grown successfully from 85 to 260 pounds weight in seven months upon a normal ration to which considerable amounts of lactic, acetic and sulphuric acids were added.

Can swelling of the colloids furnish a basis for the explanation of edema? A. D. Hirschfelder. Edema due to mustard oil in the conjunctival tissues, the effects of immersing the lid in blood serum, hydrochloric acid, etc., effects of local and general changes in blood pressure upon the development of edema, were discussed.

The following papers were read by title:

The proteins of the peanut, Arachis hypogea. II. The distribution of the basic nitrogen in the globulins arachin and conarchin.

Tissue transplantation as a biochemical method: Leo Loeb.

The alkaloids of Bocconia frutescens: Emerson R. Miller.

Microchemical studies on the mosaic disease of tobacco: G. W. Freiberg.

Some peculiarities of plant decoctions as nutrient media for fungi: R. M. Duggar.

Isolation of parahydroxy-benzoic acid from soil: E. H. Walters.

(*To be continued*)