space in front of the cathode (shown by the dotted line *mn* in the figure).

The usefulness of the above described tube for many laboratories is limited because liquid air is used in its initial adjustment and subsequent operation. If desired the bulb *B* may also be sealed off. The only disadvantage is that this fixes the gas content in the tube. In case no liquid air is available it is still possible to construct the tube provided access may be had to a good pump. In this event the discharge tube should be washed out several times with the desired gas, in order to remove every trace of air, and then sealed off when the beams are brightest. This gives a permanent tube provided the occluded gases in the electrodes and walls of the vessel do not in time let the vacuum down. Danger from this source, however, may be largely avoided by gently heating the tube during exhaustion. The obvious advantage of a charcoal bulb is that the proper exhaustion can always be reached and at the same time the discharge at various stages of exhaustion successively exhibited.

It should be added that the best results only are obtained when the hollow cathode *C*, which is an aluminum cylinder closed at the ends with aluminum discs through the center of each is cut a rectangular opening about 1 mm. by 6 mm., is placed exactly on the axis of the tube connecting the bulbs *M* and *N*. The correct position is shown in the figure, end view at *b*, and side view at *d*. The discharge leaving the cathode, confined in a narrow tube as here, is always along the axis of the glass tube, regardless of the alignment of the cathode. In other words, the shape of the glass tube rather than the shape of the cathode determines the position of the cathode beam. Lack of alignment is shown at *c* and *e* where the opening through the hollow cathode is below the axis and as a result few positive rays get through and show in the bulb *M*, though they show distinctly at their origin in front of the cathode. To avoid possible lack of alignment it is advised to make the hollow cathode *C* of such diameter so as to fit snugly into the neck connecting *M* and *N* as shown in *a* of the figure.

An interesting test to show that the beam in *N* is composed of electrons, and that in *M* of positively charged ions, is to deflect them in turn by a strong electro-magnet. The cathode beam is readily deflected while the positive ray beam is but little deflected and that in the opposite sense. This is in full agreement with the theory of the magnetic deflection of moving positive and negative charges.

CHAS. T. KNIPP

LABORATORY OF PHYSICS,
  UNIVERSITY OF ILLINOIS,
    October 9, 1915

THE AMERICAN CHEMICAL SOCIETY

THE fifty-first meeting of the American Chemical Society was held in Seattle, Washington, August 30 to September 3, 1915, inclusive. The members came to Seattle from many directions, although a special car brought thirty-three over the Great Northern railroad on the evening of the thirtieth. Those who came in the special car spent August 29 in Glacier National Park. The meeting was opened by an address of welcome by the dean of the University of Washington, to which response was made by President Herty. A general meeting was then called to order and listened to an address by Leo H. Baekeland on "Chemical Industry" and a second address by H. K. Benson on "Industrial Resources and Opportunities of the Pacific Northwest." Following these addresses the society continued in general session until noon of the following day, holding public symposiums.

On Wednesday afternoon the various additional programs were held as well as the election of additional officers for 1916. On the evening of the thirty-first a complimentary smoker was given by the Seattle Commercial Club, at which Professor Meany gave a beautifully illustrated lecture with colored slides on Mt. Rainier. The members were also entertained by a Japanese sword contest and by a Chinese cartoonist. Besides the usual attractions of the excursions and the President's address, the ladies were given special entertainment of a reception and tea on the university campus Tuesday, August 31, and an organ recital the same evening. On Wednesday they were given a special drive by automobile through the parks and boulevards of Seattle. On Wednesday the members were treated to an automobile trip through the beautiful parks and boulevards of Seattle and on Wednesday evening at 8 o'clock, President Charles H. Herty gave his presidential address, entitled "Co-

operation in Matters Chemical,'' before a large audience. On Thursday a complimentary excursion was made on a specially chartered steamer on Puget Sound and refreshments were served to members and guests present. Thursday evening a subscription banquet closed the regular meeting of the society, although other excursions were enjoyed on Friday.

On Friday, September 3, a portion of the members were taken by private yachts on Puget Sound to Tacoma and visited plants there, while a party of twenty-nine took automobiles from Tacoma to Mt. Rainier National Park, over one of the most beautiful drives in America. Saturday spent in Portland as the guests of the Oregon Section. The members were met at the train at 8 A.M. and were taken direct to one of Portland's hotels, where a complimentary breakfast was served. By automobile the members then visited either the new Gas Plant of the city or the Willamette Paper Company works at Oregon City. Following these visits, the members met for a complimentary luncheon at Portland's most beautiful Country Club. After lunch the members were shown around Portland by automobile and met at 4 o'clock to listen to a lecture by Messrs. Burger and Jones, illustrated by colored photography lantern slides showing scenes along the Columbia River and views of Mt. Hood and Mt. St. Helens. This set of views is probably the most remarkable and beautiful chemical reproductions of nature that have ever been shown before an audience. The day was thoroughly enjoyed by members present. On September 5, twenty-five members who had come through together to San Francisco were entertained at dinner at Techau Tavern by the members of the California Section in the usual hospitable manner so characteristic of California chemists. The registration at Seattle showed the presence of 106 members of the society and 119 guests.

The following papers being a continuation of series of papers first presented at New Orleans on the Chemists' Contributions to Industry, were printed in the November *Journal of Industrial and Engineering Chemistry:*

The Contributions of the Chemist to the Naval Stores Industry: JOHN E. TEEPLE.
Contributions of the Chemist to the Iron and Steel Industry: GEORGE W. SARGENT.
Contributions of the Chemist to the Iron and Steel Industry: A. S. CUSHMAN.
Contributions of the Chemist to the Art of Soap Making: M. H. ITTNER.

Contributions of the Chemist to the Perfumery Industry: E. T. BEISER.
Contributions of the Chemist to the Lead Industry: G. W. THOMPSON.
Contributions of the Chemist to the Paint and Varnish Industry: MAXIMILLIAN TOCH.
Contribution of the Chemist to the Photographic Industry: FRANCIS C. FRASY.
Contributions of the Chemist to the Pharmaceutical Products Industry: FRANK R. ELDRED.
Contributions of the Chemist to the Hardwood Distillation Industry: S. W. KATZENSTEIN.

Also the following papers comprising a symposium on the Chemistry of Wood Waste were printed in the November *Journal of Industrial and Engineering Chemistry:*
Chemical Engineering of the Hardwood Distillation Industry: JAMES R. WITHROW.
What Chemistry has done to Aid the Utilization of Wood: S. F. ACREE.
The Tannin Content of Pacific Coast Conifers: H. K. BENSON AND T. G. THOMPSON.

A study of the tannin content of hemlock, spruce and Douglas fir from western Washington was made. Local tanneries use the bark of the western hemlock, which contains above 15 per cent. tannin in commercial practise. From sawmills operating under average conditions bark, slabs and sawdust from cross-cut saws were obtained. These were sampled, extracted and analyzed according to the Official Method of the Leather Chemists' Association. The results of the analysis for tannin reported on a dry basis are as follows:

Per Cent. Tannin

Fir bark	6.34
Fir slab	5.92
Fir sawdust	1.06
Fir cambium layer	9.92
Spruce bark	5.88
Spruce slab	3.69

Inasmuch as the tannin content of the fir slab approaches that of chestnut wood (6.62 per cent.) and owing to the low cost of fir slabs (less than $2 per cord), it is believed that the extraction of tannin from fir slabs is a commercial possibility. A local tannery used fir extract in the tanning of sheep-skin and reported good quality and a color similar to that obtained from oak tannin.

Yields of By-products from Destructive Distillation of Some Western Conifers: H. K. BENSON AND MARC DARRIN.

The following classes of woods were treated at the Forest Service distillation plant at Seattle:[1]

[1] For design see *Jour. Ind. Eng. Chemistry,* Vol. 5, No. 11.

(1) Douglas fir common run mill waste, (2) Douglas fir selected mill waste, (3) Douglas fir common run stump wood, (4) western yellow pine common run mill waste, (5) western yellow pine common run stump wood, (6) western hemlock common run mill waste. The highest yield of wood alcohol was 5.00 gallons per cord from the hemlock; the lowest 1.83 gallons per cord from the pine stumps; the average yield from Douglas fir common run mill waste was 3.90 per cord against 2.60 from the stumps. The highest yield of acetate of lime was likewise in the case of the hemlock, being 94.0 pounds per cord; the lowest was 55.8 for the fir stumps. This figure was close to that for the pine stumps at 60.8. The yield for the fir common run mill waste was 75.0 pounds per cord, against 74.3 pounds for the selected. The selected Douglas fir mill waste had by far the greatest yields of oils of a turpentine character, being 10.86 gallons per cord. The lowest yield was 2.76 for hemlock. The yield for the fir common run mill waste was 3.40 gallons against 5.59 for the stumps; 4.91 for the pine mill waste, and 6.06 for the pine stumps. Likewise, the selected fir mill waste had the greatest yield of tar, being 46.37 gallons per cord; the lowest yield was 19.88 for the Douglas fir stump wood. The other yields ranged close to the last figure, the largest being 27.80 for the Douglas fir mill waste. The highest yield of charcoal was 977 pounds for the Douglas fir common run mill waste. This figure was followed by those for hemlock and the selected Douglas fir at 938 and 900, respectively. The lowest yield was for pine, being 478 and 520 pounds for the mill waste and the stumps respectively.

From this data the authors find that the most suitable wood for distillation is the Douglas fir selected mill waste, followed by the Douglas fir common run mill waste.

The Use of Ammonium Hydroxide for Extraction of Rosin from Wood: H. K. BENSON AND HERBERT N. CRITES.

A five per cent. solution of ammonium hydroxide was used to extract resinous fir wood. Practically complete extraction was obtained when the chips were covered in pressure bottles with a quantity of the ammonia solution equal to eight times the weight of the wood at a temperature of 70° C. for five hours. The chips were washed with a quantity of five per cent. ammonia solution equal to twice the weight of the wood to recover the one per cent. rosin adhering to the chips. Rosin dissolves in ammonium hydroxide to form ammonium resinate, which upon heating to 100°

C. decomposes, forming ammonia and leaving a residue of rosin and "humus." The ammonia is recovered by the method used in gas works and again used in the process. The mixture of rosin and "humus" is then agitated with gasoline, whereby the rosin goes into solution from which the "humus" is removed by filtration. The rosin solution is evaporated, the gasoline being condensed and recovered and the molten rosin run from the still into containers, where it solidifies upon cooling. The "humus" is in the form of a brown powder and other investigations show its suitability for the manufacture of dyes. From resinous fir wood 700 pounds rosin and 500 pounds "humus" per cord were obtained.

Discoloration of Maple in the Kiln: ROY C. JUDD.

The Chemical Composition of the Light Oil from the Destructive Distillation of Resinous Woods: R. E. ROSE AND A. G. BISSELL.

The Manufacture of Ethyl Alcohol from Wood Waste. II. The Hydrolysis of White Spruce: F. W. KRESSMANN.

A continuation of the work previously prepared has shown first that the ratio of water to dry wood is without appreciable influence as long as sufficient water is used to dilute the acid so as to give an intimate mixture of acid with wood. In the former work, the ratio of water to dry wood was 400 to 100, which has been reduced to 100 to 100, although the ratio of 125 parts of water to 100 parts of dry wood is recommended, since this will give a digested sawdust free from drip. The ratio of the catalyzing agent (sulphuric acid) to dry wood has been varied from 5 parts per thousand (0.5 per cent.) to 40 parts per thousand (4 per cent.). Two and one half per cent. of acid was found to give the best results, considered both from a total sugar and from fermentable sugar standpoint. The variation of the concentration of catalyzing agent in the water added was found to be without effect so long as the actual amount of catalyzing agent as compared to the dry wood was not varied. With instantaneous cooks and with increasing concentration with sulphuric acid, the yield of alcohol increased from 4.17 per cent. with .5 per cent. sulphuric acid up to 7 per cent. with 4 per cent. sulphuric acid. It was found, as reported previously, that the sugar yields did not vary with the time of cooking, but more careful fermentation work has shown that although the total sugar yield does not vary appreciably, the percentage of that sugar which is fermentable increases with increased time of cooking. A 20-minute cook at 7½ atmospheres pressures with 2½ per cent. sulphuric

acid and 125 per cent. of water gave an alcohol yield of 8.54 per cent. of the dry weight of the wood or about 25 gallons per dry ton.

The Application of the Davis Spot Test in the Preliminary Examination of Creosotes: HOMER CLOUKEY.

Isoprene from Beta-pinene: A. W. SCHORGER AND RALPH SAYRE.

The Distillation of Douglas Fir at High Temperatures: BAILEY TREMPER.

The Manufacture of Ethyl Alcohol from Wood Waste. III. Western Larch as a Raw Material: F. W. KRESSMANN.

The butt log of western larch is usually left in the woods because of the presence of shakes and also because of the weight of the log, which is heavier than water and, therefore, sinks, preventing rafting. An investigation of this material showed a sugar yield of 29.7 under the same conditions that would yield about 22 per cent. from white spruce. However, only 37.9 per cent. of the larch sugar was fermentable against from 60 to 65 per cent. of total sugar fermentable from spruce. Analysis of the larch by Mr. A. W. Schorger of this laboratory showed only 42½ per cent. of cellulose as compared with about 56 per cent. from spruce and also the presence of about 12 per cent. of galactan, which yielded galactose on hydrolysis, which, however, was not fermentable by the yeast used. Calculations show that the proportion of fermentable sugars to cellulose is about the same for larch as for spruce. If a yeast is found which will ferment the galactose as well as the dextrose within the time limits and other limitations, as prescribed by the Bureau of Internal Revenue, this material will afford a very good raw material for the production of ethyl alcohol.

The Production of Acetone from Pyroligneous Acid: MARC DARRIN.

DIVISION OF AGRICULTURAL AND FOOD CHEMISTRY

Floyd W. Robinson, Chairman

Glen F. Mason, Secretary

The Activity of Proteolytic Enzymes in Breadmaking: ARNOLD WAHL.

The Spontaneous Decomposition of Butter Fat: C. A. BROWNE.

The analytical constants are given for a number of butter fats exposed to the light and air before and after a period of 15 years. The results show that the fats have undergone an increase in the acid, saponification and volatile acid numbers and a decrease in the ether and iodine numbers. The mean molecular weight of the free volatile acids was 91.7 and of the combined volatile acids 105.4; the average mean molecular weight of the total volatile acids was 99.5, which agrees closely with that for normal butter fat. The total percentage of volatile acids had increased from 7.2 per cent. to 8.6 per cent. and the total percentage of insoluble acids had decreased from 87.6 per cent. to 79.7 per cent. The insoluble acids had an acetyl number of 36.4 corresponding to 20 per cent. of hydroxy-stearic acid and an ether number of 8.3 corresponding to 4.2 per cent. of stearo-lactone. A proximate analysis of the decomposed butter fat gave 63.50 per cent. neutral fat, 27.15 per cent. free insoluble acids, 3.90 per cent. free soluble acids, 5.42 per cent. undetermined. The iodine number of the free insoluble acids was 11.3 and of the combined insoluble acids 12.1. Experiments upon the change in weight which butter fats undergo with age showed that there was a 2 per cent. to 3 per cent. increase in weight in about one year, the period of greatest increase being about the tenth week. Very old butter fats lose in weight, owing to the escape of water, carbon dioxide, volatile acids and aldehyde decomposition products. The theories of the spontaneous decomposition of fats are discussed; the author believes that the observed facts are best explained by supposing an absorption of oxygen molecules from the air at the unsaturated bonds, one atom of active oxygen being liberated for each atom of oxygen absorbed. The disintegration of the glycerides, being proportional to the percentage of unsaturated acids, is attributed to the action of the active oxygen. Experiments are cited to prove that such atoms of active oxygen are formed.

The Analysis of Maple Products. V. Miscellaneous Observations on Maple Syrup Incidental to a Search for New Methods of detecting Adulteration: J. F. SNELL.

(1) Silver nitrate added to maple syrup gives a white precipitate which darkens on standing. The precipitation of silver continues during a period of several hours. (2) Mercuric acetate added to maple syrup produces a light yellow precipitate. (3) Alcohol produces a precipitate containing most of the calcium and potassium. (4) A moderately successful attempt was made to combine the advantages of the Winton and Canadian lead subacetate methods. (5) The Canadian lead precipitates from six syrups showed a lead content of 66.95 to 69.62 per cent. Average 68.42. The precipitate from a composite of 542 syrups contained 69.41 per cent. of lead, while

that from another mixed syrup contained 70.11 per cent. (6) Titration of maple syrup with $N/50$ silver nitrate (a) directly, using electrical resistance measurements to detect the end point (b) after treatment with lead subacetate, or alumina cream, using potassium chromate as indicator yielded definite but not useful results. (7) Titration with uranyl acetate gave no useful results. (8) Titration with lead subacetate solutions using electrical resistance as indicator led to a useful method of testing the syrup for purity, which is described in the next paper of the series.

A Volumetric Lead Subacetate Test for Purity of Maple Syrup: J. F. SNELL, N. C. MACFARLANE AND G. J. VAN ZOEREN.

(1) The volumetric lead subacetate test consists in diluting the syrup to ten times its original volume and titrating with lead subacetate solution of sp. gr. 1.033, obtaining the end-point by measurements of electrical resistance. (2) The volumetric lead number is the abscissa of the point of intersection of two straight lines on the plot of volumes as abscissæ with resistance as ordinates. (3) Seventy genuine Quebec 1914 and 1915 syrups gave volumetric lead numbers ranging from 4.8 to 6.6—a range of 37.5 per cent. of the minimum as compared with 97 per cent. for the conductivity value. Twenty-eight of these syrups showed a range of 75 per cent. for the conductivity value and 339 per cent. for the Canadian lead number, while the range of volumetric lead number was the same as in the whole 70. (4) Seventeen out of 20 syrups containing 30 per cent. of sucrose syrup gave smooth curve plots. Eighteen out of 20 containing 40 per cent. sucrose syrup gave smooth curves and the remaining two gave intersections outside the limits for genuine syrups. Of 14 adulterated and non-maple syrups 10 gave smooth curve plots, 2 gave intersections outside the limits found in genuine syrups and in the remaining 2 (cane molasses) the electrical resistance remained constant.

The Electrical Conductivity Test for Purity of Maple Syrup. Corrections and Supplement to Paper I.: J. F. SNELL.

(1) A number of minor corrections to paper I., as published in the *Journal of Industrial and Engineering Chemistry*, are noted. (2) The directions are modified to suit a new type of electrode. (3) Experience with the test has shown that the limits of variation of the conductivity value in genuine syrups are wider than appeared when paper I. was published. However, these limits are still narrower than those of any of the older analytical values.

The Determination of Total Solids in Milk by Open-Air and Vacuum Methods: GEO. GRINDROD.

Results obtained by several different methods of drying are given and the methods compared as to accuracy. Moisture absorbed by milk residues was found to cause them to lose weight when further heated. Repeated weighing till minimum weight is reached, as usually practised, is liable to cause erroneous results on account of moisture absorbed during weighing. Repeated analyses of samples from the same lot of condensed milk over a period of one year show atmospheric pressure drying subject to error. Vacuum apparatus especially adapted to determination of total solids in milk is described. Results by this apparatus found more accurate than other methods.

DIVISION OF PHYSICAL AND INORGANIC CHEMISTRY

G. A. Hulett, Chairman

R. C. Wells, Secretary

Anodic Relations of Passive Iron: H. G. BYERS AND SETH C. LANGDON.

Electrolytic Endosmose: RUBY CLIFT AND GEORGE GLOCKLER.

The Stabilizing Influence of Hydrogen Sulfide on Colloidal Metallic Sulfide Solutions: S. W. YOUNG.

Equilibria Internary Systems containing Alcohols, Salts and Water: GEORGE BELL FRANKFORTER AND STERLING TEMPLE.

A study was made of the use of some salts to determine the per cent. of alcohols in mixtures of alcohol and water by means of the amount of salt which could be added without causing a separation into two layers. Curves were drawn and directions given for the use of the method. The following systems were investigated: Propyl Alcohol–Sodium Carbonate–Water, Isopropyl Alcohol–Potassium Fluoride–Water, Isopropyl Alcohol–Potassium Carbonate–Water, Allyl Alcohol–Potassium Fluoride–Water, Allyl Alcohol–Potassium Carbonate–Water, Allyl Alcohol–Sodium Carbonate–Water and Allyl Alcohol–Sodium Chloride–Water. This work together with the work of Frankforter and Frary indicates that potassium fluoride and potassium carbonate can be very successfully used for a quick method of determining the strength of solutions of ethyl, propyl, isopropyl and allyl alcohols. The evidence did not support the hypothesis that the salting out power of a salt could be predetermined from a knowledge of the ions in the solution, but showed that it was rather a function of the amount of water which the salt took up to form its hydrates, the

solubility of the salt and of its hydrates both in water and in alcohol and the ability of the alcohol to displace the water of combination.

Equilibria in Systems of Ketones, Water and Salts with a Method for the Determination of Methyl Alcohol in the Presence of Acetone: G. B. FRANKFORTER AND LILLIAN COHEN.

The Influence of Dissolved Substances upon the Velocity of Crystallization of Under-cooled Water: JAMES H. WALTON, JR., AND A. C. BRANN.

The velocity of crystallization of under-cooled water has been measured at — 9°, and the inhibiting effect of dissolved substances—such as acids, alkalies, salts, alcohols and some colloidal substances—determined. When possible tenth molecular solutions were used. It has been found that a rough proportionality exists between the number of atoms in the molecular and the inhibiting effect. The greater the number of atoms in a molecule of dissolved substance the slower the rate of crystallization.

The Partition Coefficients of Hydrogen Peroxide between Water and Certain Organic Solvents: JAMES H. WALTON, JR., AND H. A. LEWIS.

Hydrogen peroxide is soluble in many organic solvents, such as phenol, aniline and certain esters. In general, any organic liquid that dissolves water will dissolve hydrogen peroxide. A determination of the partition coefficient in most of these solvents shows a normal molecular weight for the peroxide. In Quinoline the partition coefficient water: quinoline, is about 1: 3. This ratio changes with change of concentration of hydrogen peroxide, pointing to association of the molecule in the quinoline solution. The partition coefficient water: quinoline, has been studied at various temperatures.

The Preparation of Pure Iron and Iron Carbon Alloys: J. R. CAIN, E. SCHRAMM, AND H. E. CLEAVES.

It is shown that previous work on the iron-carbon diagram is unsatisfactory because of the great variation in the materials used. It was therefore thought necessary to produce a series of alloys of great purity to form the basis of a redetermination of the diagram at the Bureau of Standards. The general method pursued consisted in melting electrolytic iron with sugar carbon in magnesia crucibles. The electrolytic iron was prepared from ingot iron anodes in a chloride bath with or without the use of porous cups. The operation of melting the iron with carbon gave great trouble

at first, because the ingots obtained were full of blow-holes and contained considerable quantities of impurities. The difficulties were overcome by melting in a vacuum furnace, and making crucibles of especially pure magnesia, made and calcined with great care at the Bureau of Standards. A satisfactory procedure was finally worked out and a series of alloys prepared of the composition $Fe + C = 99.96$ per cent.

The Oxides of Iron. I. Solid Solution in the System Fe_2O_3—Fe_3O_4: ROBERT B. SOSMAN AND J. C. HOSTETTER.

This investigation of the chemical relationships of the iron oxides has been undertaken as a basis for the study of the iron-bearing silicates at high temperatures. Measurements of the dissociation pressure of the iron oxides were made in a vacuum furnace with a heating tube of platinum-rhodium. A study of the conditions of equilibrium shows that reproducible oxygen pressures can be obtained at a given temperature. Equilibrium is attained in a few minutes at high temperatures, although certain disturbing reactions go on slowly. One of these by-reactions is the reduction of the oxide by platinum, yielding oxygen and an iron-platinum alloy. Another is a slow disappearance of oxygen, which has not been satisfactorily explained. Ferric oxides from various sources yield practically identical pressures. The same pressures are also attained on both rising and falling temperatures. The oxidation of magnetite gives pressures which are a little higher than those produced by dissociation of Fe_2O_3. The pressure-composition isotherm for the system Fe_2O_3—Fe_3O_4 at 1,200° indicates a continuous solid solution series from Fe_2O_3 over to a point very near Fe_3O_4, if not over the entire range to Fe_3O_4. The opacity of the products prevents an optical demonstration of the existence of solid solution in products with more than 18 per cent. FeO, but its existence can be shown optically in products which are more ferric than this. The pressure-composition isotherm at 1,100° confirms that at 1,200°. The major portion of the oxygen pressure curve of the system at 1,200° lies between the limits 4 mm. and 1.5 mm. The pressure drops rapidly near Fe_3O_4, and rises rapidly near Fe_2O_3. Since the dissociation of Fe_2O_3 results in the formation of a solid solution, the pressure of oxygen and the composition of the solid phase depend upon the relation of the weight of the charge to the volume of the space into which the oxygen dissociates. This fact accounts for the variety and un-

certainty of results heretofore obtained in experiments on the dissociation pressure of Fe_2O_3.

The Water Correction in Conductivity Determinations: JAMES KENDALL.

Conductivity water, however carefully prepared, can not be kept for more than a short period in contact with air without its specific conductivity rising to about 0.9×10^{-6} reciprocal ohms (at 25° C.). This value represents also the specific conductivity of pure water saturated with CO_2 under the ordinary atmospheric partial pressures (3.69 parts in 10,000). It is therefore possible to obtain accurate conductivity values for very dilute solutions of any electrolyte by applying a correction for carbonic acid. This has been done for strong electrolytes (Arrhenius), transition electrolytes (Kendall), and weak electrolytes (Walker and Kendall). The results obtained indicate conclusively the accuracy of the corrections so applied.

Conductance Data and Empirical Equations: STUART J. BATES.

The application to experimental data of empirical equations or of the similar but less sensitive method of plotting the results, is of value chiefly as a means of interpolation and of judging the accuracy of data. However, in the latter case great caution must be employed. This is illustrated by the fact that as a result of the application of the Kraus equation to the conductance data for KCl, the data below 0.001 N were rejected as inaccurate. It is found, however, by the application of the equation

$$\log \frac{C_i^2}{C_u} = K + TX^m,$$

where $X = C_i$, C_u or C, to these data, that they are consistent. The data for KCl between 1.0 N and 0.0001 N agree with this equation with an average deviation of but 0.03 per cent. when $X = C_i$ or C_u and of 0.07 per cent. when $X = C$. The above equation is applicable to other aqueous solutions and to non-aqueous solutions. It is apparently as generally applicable as that of Kraus. However, in the case of salts such as KNO_3 which give a minimum value for n (the exponent in Storch's equation), neither the equation of Kraus nor that given above is capable of representing the data throughout the entire concentration range.

A Quantitative Measure of the Deviation from the Law of Mass Action: STUART J. BATES.

The strict obedience of an electrolyte to the law of mass action may be readily tested by observing the constancy of the equilibrium expression C_i^t/C_u. However, this does not afford a quantitative means of judging the magnitude of the deviations at different concentrations of two or more electrolytes. For example, which deviates the more, dichloracetic acid at 0.1 N or KCl at 0.001 N? The equilibrium expression for a strong electrolyte corresponding to any concentration may be calculated, but there is nothing with which to compare it, for in this case the uncertainty in the "ionization constant at infinite dilution" which is a true constant in the case of weak electrolytes, is often as great as 1,000 per cent. However, if the law of mass action is obeyed by a diionic electrolyte at a certain concentration, then the exponent n in Storch's equation $C^n/C_u = K$, has the definite and theoretical value 2. By comparing the value which n does have at a given concentration with this value (2), a quantitative measure of the deviation is given. Let $d = (2 - n)/n$, then if $d = 0$ the mass law is obeyed. The greater d is, the greater the deviation; d may be either positive or negative. Since in general n changes with the concentration, d changes with the concentration, becoming smaller with decreasing concentration. The undissociated molecules are in general largely responsible for the deviation from the law of mass action. Since their behavior may be readily expressed in terms of osmotic pressure, d has been defined so that it is an approximate measure of the deviation of these molecules from van 't Hoff's law.

Ion Concentration and the Law of Mass Action: STUART J. BATES.

The deviation of solutions of strong electrolytes from the law of mass action is usually considered to be due to the presence of the charged ions in the solutions. This view has an *a priori* possibility and is considered by many to be supported by two facts. The first is that the conductance of solutions containing two salts may be readily calculated upon the isohydric principle. Bray and Hunt have pointed out, however, that the conductance may be calculated upon the basis of the total concentration also. The second is that the equilibrium expressions of strong electrolytes may be readily expressed as functions of the total ion concentration, as for example, by the equations of Storch and of Kraus. But the expression may be equally well represented as a function of the total concentration or of the concentration of the undissociated molecules. (See preceding abstracts.) Direct proof that the ion concentration does not control the thermodynamic environment of the so-

lution, that is, that it does not materially influence the deviation from the law of mass action, is afforded by a comparison of the magnitude of the deviation at various ion concentrations for different electrolytes. Thus at the ion concentration 0.001 N, d for KCl equals 0.29, for dichloracetic d is less than 0.003 and for acetic acid it has a small negative value. At the ion concentration 0.05 N, the values for the first two electrolytes are 0.40 and 0.06, respectively. Evidently there is no parallelism between ion concentration and the magnitude of the deviation from the law of mass action. The former does not control the latter. The osmotic pressure or activity of the undissociated molecules depends largely upon their type. They are more abnormal the stronger the electrolyte.

The Calorimetric Determination of Ferrous and Ferric Iron: O. L. BARNEBEY.

Differential Iodimetry. I. The Titration of Periodates, Iodates, Bromates and Chlorates in the Presence of Each Other and in the Presence of Perchlorates: O. L. BARNEBEY.

Molecular Weights of Gases by an Evaporation Method: H. L. TRUMBULL.

That liquids evaporate into different gases at different rates was first pointed out by Stefan. Winckelmann, and Guglielmo extended the work of Stefan, to include many liquids, and a general agreement between all their results was noted, viz.: that evaporation is most rapid into hydrogen and correspondingly less rapid into heavier gases. The methods employed by the earlier investigators were not all that could be desired, being at fault in the matters of temperature control, elimination of wind currents, and the employment of a height loss, rather than a weight loss method.

The object of this investigation was to find a simple and accurate method for the measurement of rates of evaporation of water into different gases, with a view to the relations between the rates and densities of the gases used. These experiments were conducted in a perfectly dry atmosphere, free from air currents, at a constant temperature of $25°.07 \pm 0°.01$, and by a weight loss method. A comparison of the evaporation constants obtained in this experiment leads to the following results. The predicted values of the relative diffusion rates on the basis of Graham's law are hydrogen to air, 3.79, hydrogen to CO_2, 4.67, air to CO_2, 1.24. The means of the corresponding rates by this evaporation method are 3.37, 4.68, and 1.393. Various applications are cited.

Production of Potassium Chlorate from Kelp: H. L. TRUMBULL AND H. C. HOWARD.

Electrolysis of a solution obtained by pressing and lixiviating the kelp produces chlorates with a current efficiency of 50 per cent. and an energy expenditure of 7K.W.H. per pound of chlorate. No purification of the raw material is required. Because of the great difference in solubility of the sodium and the potassium chlorates the latter is easily obtained in a pure state.

DIVISION OF INDUSTRIAL CHEMISTS AND CHEMICAL ENGINEERS

Geo. P. Adamson, Chairman

S. H. Salisbury, Jr., Secretary

Additional papers not read in symposiums.

Refining Vegetable Oils: CHAS. BASKERVILLE.

The Relation of Water Power to Chemical Industry: HENRY J. PIERCE.

"Viscosimeters": R. F. MACMICHAEL.

The Function of Cooking Fossil Resins in Varnish Manufacture: W. L. JEFFRIES AND CHAS. H. HERTY.

A Test of a Surface Combustion Furnace: E. SCHRAMM AND J. R. CAIN.

In view of the fact that the surface combustion process appeared to offer many advantages for high-temperature laboratory furnaces, it was decided to submit a crucible furnace of this type to a thorough test. For the purpose, the furnace was equipped with meters on the gas and air lines and with a chimney to permit the collection of flue gas samples. In several runs the mixture proportions were maintained constant, while varying the rate of gas consumption. Temperatures were read by a Hollborn-Kurlbaum optical pyrometer. The highest temperature reached was 1675° C., at which point the alundum muffle failed. The test established that complete combustion could be attained without excess air, that the best air: gas ratio was 5.5, and that a 20-per-cent. excess of air caused a lowering of furnace temperature of 100°.

BIOLOGICAL CHEMISTRY DIVISION

Carl L. Alsberg, Chairman

I. K. Phelps, Secretary

Mutual Action of Similarly Charged Colloids: W. D. BANCROFT.

Adsorption of Colloids by Liquids: W. D. BANCROFT.

Formation of Surface Films: W. D. BANCROFT.

A Search for Hydrocyanic Acid in the Caprifoliaceæ: C. L. ALSBERG.

A number of American species of the Caprifoliaceæ were tested for hydrocyanic acid, because those reported from other countries showed the presence of hydrocyanic acid. Those tested showed none, either on hydrolysis with acid alone or with emulsion also present.

The Reaction of the Pancreas: J. H. LONG AND F. FENGER.

The pancreatic juice of man and the domestic animals, as collected by a fistula, is known to have a rather marked alkaline reaction. No attention has been paid to the reaction of the press juice of the organ itself. This may be separated by pressure from the minced gland, but very perfectly by aid of one of the powerful laboratory centrifuges now in use. In the experiments carried out by the authors the centrifuge tubes were charged with about 75 grams of the minced organ, each, and given a speed of 3,000 revolutions per minute through 45 minutes. The clear liquid separated, the real pancreatic juice, had a distinct acid reaction in the cases of the beef, hog and sheep pancreases, and nearly constant in degree. It was found to lie between $C = 25 \times 10^{-7}$ and 30×10^{-7}. The reaction may be found to be as characteristic as that of the blood and is doubtless related to it. In the physiological activity of the organ an acid fraction seems to be retained, while an alkaline fraction is thrown to the duodenum. A rearrangement of the phosphate and carbonate groups of the blood would account for both reactions. In this centrifugal separation, besides the liquid, a lower layer of matter largely protein is obtained and an upper layer of fat and protein. The fresh minced gland, also, shows the acid reaction.

On the Digestive Activity and Composition of Separate Fractions of the Pancreas: J. H. LONG, MARY HULL AND H. V. ATKINSON.

As shown in the preceding abstract, the minced pancreas may be readily separated into three fractions by rotation in a powerful centrifuge. The authors have found the relative volumes of these fractions somewhat variable, depending on the speed and duration of rotation. The lower layer may make up fifty per cent., or more, of the whole, and is largely protein. It exhibits both amylolytic and tryptolytic activity. The middle layer is liquid and usually makes twenty to twenty-five per cent. of the contents of the centrifuge tube. The starch-converting power of this liquid is sometimes very strong, especially in the case of the hog pancreas, where one part of it has been found to convert over 150 parts of starch to the colorless

end-point in ten minutes. Trypsin is also present, and no activator is required to bring out its power. The top layer contains much fat and some protein and is deficient in ferment activity. The fat is rich in phosphorus, pointing to the presence of lipoid bodies of the lecithin type. The freezing-point of the liquid layer is apparently a constant for the product from each animal, provided the maximum of liquid is obtained. For the beef product the value was found to be about — 1.12 and for the hog — 1.62. The investigations are being continued.

Kelp: F. K. CAMERON.

The Inadequacy of Schultz's Valency Rule: W. D. BANCROFT.

The Evolution of the Yeast Type especially Adaptable for Bread-making: A. WAHL.

A Theory regarding Protoplasmic Structure, based on the Study of Emulsion Equilibrium: G. H. A. CLOWES.

Alleged Abnormal Adsorption of Filter Paper: W. D. BANCROFT.

Adsorption of Acids by Cellulose: W. D. BANCROFT.

Oxycellulose: W. D. BANCROFT.

Boron—Its Absorption and Distribution in Plants and Its Effect on Growth: F. C. COOK.

Boron was applied to manure as a larvicide for the fly maggot, either as borax or calcined colemanite. The effect of the boron-treated manure on plant growth was studied at Arlington, Virginia, Dallas, Texas, New Orleans, Louisiana, and Orlando, Florida, and various plants and soil samples were analyzed for boron. Boron was absorbed by the plants from the calcined colemanite plats in the same amounts as from the borax plats. Lime added to the manure with the borax had no definite action in preventing the absorption of boron.

Potatoes, string beans, soy beans and cow peas showed a more equal distribution of the boron among the roots, tops and fruit than was the case with the wheat, beets, tomatoes, radishes and lettuce plants analyzed. In some cases very little boron was found in the roots or fruit, while a considerable amount was found in the rest of the plant. All control plants contained at least a trace of boron. Some control samples of soil contained boron soluble in weak hydrochloric acid, while several of the boron-treated plats several months after boron was added showed none soluble in weak hydrochloric acid in the upper six inches of soil. If sufficient boron was added to the soil a yellowing of the leaves took place, but this does not neces-

sarily indicate that the yield will be affected. The leguminous plants were more sensitive to boron than the other plants tested. Variations in soil, climate and the resistance of different varieties make it impossible to give a figure for the amount of boron which all plants can stand with impunity.

Boron, Its Absorption and Distribution in Plants and Its Effect on Growth: F. C. Cook.

A Study of the Calcium and Magnesium Metabolism in a Case of Chronic Gout: Jacob Rosenbloom.

Metabolism Studies in a Case of Bronchial Asthma: Jacob Rosenbloom.

Note on Semipermeable Membranes: W. D. Bancroft.

Dilute Solutions of Gelatine: W. D. Bancroft.

Nephelometric Estimation of Phosphorus: Philip Adolph Kober and Grete Egerer.

(1) The reagent of Pouget and Chouchak has been modified so as to be: (*a*) stable, (*b*) colorless, (*c*) quantitatively and (*d*) nephelometrically applicable. (2) It is shown that 0.005 milligram of phosphorus in 10 c.c. of solution, or some part of phosphorus in two million parts of water is easily determined quantitatively with the nephelometer.

Spectrographic Study of Amino Acids and Polypeptides: Philip Adolph Kober, with the assistance of Walther Eberlein.

(1) The absorption of aliphatic amino acids, in acid or alkaline solution, is only general, in the extreme ultra-violet. (2) The aromatic amino acids show absorption bands, which may be useful in detecting their presence in peptide chains. (3) The presence of an excess of alkali with these substances seems to increase the amount of absorption and tends to shift it towards the red end of the spectrum. (4) The absorption of di- and tri-peptides in acid or alkaline solution showed no special absorption, it being similar to that of the free amino acids. (5) The lack of special absorption of the peptides in alkaline solution; and other points which were discussed, show that the keto-enol tautomerism in peptide linkings, as suggested by Dakin and Dudley, in explanation of the ''racemization'' of proteins, is doubtful and unsupported.

Production of Citric Acid by Black Aspergillus: James N. Currie.

The acidity of young cultures of black *Aspergillus* (*A. niger*) was found to be greater in many cases than could be accounted for by the oxalate radical present. A study of this problem revealed the fact that citric acid to the amount of 0.3 to 0.4 gram per 100 c.c. of media was present. The citric acid seems to be a transitory product which appears almost as soon as the mold begins to develop, reaches a maximum in 3 to 4 days, then declines and in most cases disappears within a week.

Production of Oxalic Acid by Aspergillus Ficuums: James N. Currie.

The literature of fungi records *Aspergillus niger* as the oxalic acid ferment par excellence and states that this mold will produce one per cent. of free oxalic acid on sugar media. A culture of *Aspergillus ficuum,* Schiemann, which has come under our observation produces on cane sugar media under favorable conditions 2.7 to 3.0 per cent. of free oxalic acid and in the presence of $CaCo_3$ give a yield of 80 per cent.

An Oxalic Acid Producing Penicillium: James N. Currie and Charles Thom.

A green penicillium common on moldy corn and corn meal was observed to produce large amounts of oxalic acid. This mold resembles *P. italicum* of Wehmer in morphology, but differs so widely from that species in appearance and habits that we propose the name *P. oxalicum.* On a 5 per cent. sugar medium it produces an acidity of about 0.8 per cent., calculated to $(COOH)_2$, $2H_2O$, in one week, and in the presence of $CaCO_3$ converts 40 per cent. of the sugar to oxalic acid. This is much the most active oxalic-acid producer ever observed among the penicillium.

Quantitative Changes in the Growth of the Human Brain: E. A. Dorsey and C. G. MacArthur.

The per cent. of solids increases with age to maturity. The cerebrosides and sulfatids are not found in fetus or brains up to a year old. From that time on they increase gradually with age to maturity. The proteins and phosphatids become larger in percentage amounts from three-month fetus to nineteen-year brain. From that age on most of the constituents are nearly constant.

Respiration of Nervous Tissue: O. C. Jones and C. G. MacArthur.

A comparison of the various parts of the nervous system showed that the cerebrum and cerebellum respire fastest. Then, mid-brain, corpus callosum, medulla in the order named. The spinal cord takes up about half as much oxygen and gives off about half as much carbon dioxide as the cerebrum. The sciatic nerve, however, respires but half as fast as the spinal cord. Of the different animals, in general, the older and larger respire more slowly, per gram of tissue, than the younger and smaller. This investigation was carried out

with a modification of the Mathews-Bunzel oxidation apparatus on very fresh tissue.

Nitrogenous Products from Brain Lecithin: J. DARRAH AND C. G. MACARTHUR.

There is about 0.2 per cent. nitrogen in brain lecithin in an unknown form. This remains in the fatty acid residue after hydrolysis of the lecithin. About 0.8 per cent. nitrogen is present as chlorine. This was confirmed in the usual way as the platinum compound. The other 0.8 per cent. of the nitrogen was identified as amino ethyl alcohol both by the gold salt and by the picrolonate derivative.

Some Physico-Chemical Properties of Several Brain Lipoids: G. NIEDERMAN AND C. G. MAC-ARTHUR.

Respiration of Nerve Tissue: O. C. JONES AND C. G. MACARTHUR.

Some Effects of Large Applications of Certain Commercial Fertilizers: GEORGE D. BEAL AND FRED WEAVER MUNCIE.

In connection with the study of fertilizers for greenhouse crops, the author has investigated the effects of excessive applications of certain commercial fertilizers upon carnations. The fertilizers chosen for this purpose were ammonium sulfate, dried blood, commercial acid phosphate, disodium phosphate and potassium sulfate. It was found that the ease and rapidity with which overfeeding effects appeared depended in a general way upon the solubility of the fertilizer in water, and three classes were distinguished: (1) those fertilizers quite soluble and producing immediate injury when applied in large quantities; (2) those fairly soluble and producing delayed injury, and (3) those difficultly soluble and producing no injury when applied in any quantities. Ash and mineral determinations showed the increased intake of the fertilizing salts when large quantities were applied. The total nitrogen content of the plants could be increased nearly threefold when ammonium sulfate was applied to the soil. Serious injury followed the use of large quantities of it, although the plants acquired a certain tolerance when the salt was applied over a long period in small quantities. Free ammonia (as ammonium salts) was found in plants so fed. Lime decreased the intake of sulfate and phosphate, but increased the injury from ammonium sulfate. Osmotic pressure determinations on the sap from shoots (expressed after freezing) showed that with any single fertilizer the increased intake of the salt, and after injury became apparent, the greater degree of injury was correlated with a higher osmotic pressure value. The value at which injury became noticeable was different for the different fertilizers, being lowest for ammonium sulfate and highest for potassium sulfate. Total solids determinations on the sap from plants treated with the latter salt were abnormally high. A study of the sugar content of the sap by polarimetric and gravimetric methods showed a larger percentage of sugars in this sap than in that from plants normally fed. This increase was shown to be due to a larger amount of maltose. Starch determinations made on the foliage showed a lower content of starch corresponding with the higher maltose value. Under greenhouse conditions applications of ammonium sulfate caused an increase in the total acidity of the sap expressed from the shoots. Potassium sulfate caused no change. Sodium phosphate (di) although slightly alkaline to phenolphthalein itself caused an increased total acidity in the sap. This was shown to be due to increased amounts of dihydrogen phosphate in the sap, and the intake of the phosphate from this monohydrogen salt in form of the dihydrogen phosphate to be true in water culture as well as in soil.

Improved Methods for the Separation of the Higher Saturated Fatty Acids and the Properties of Alfalfa Seed Oil: C. A. JACOBSON.

DIVISION OF PHARMACEUTICAL CHEMISTRY

F. R. Eldred, Chairman

A. P. Sy, Secretary

The Alkaloidal Content of Hyoscyamus grown in Minnesota: E. L. NEWCOMB.

N. and H. advise treating biennial henbane seed with conc. H_2SO_4 for two and one half minutes in order to secure early and uniform germination. Untreated seed give very variable germination results.

The observation of two species of biennial *Hyoscyamus niger* which possess the semi-latent capacity of growing as annuals is reported. The basal leaves of the biennial *H. niger* lose about 9 per cent. of moisture upon drying. The lamina yield from 14.2 to 14.8 per cent. of ash and 0.0896 per cent. of total alkaloids. The petioles of the basal leaves lose 91.6 per cent. of moisture upon drying, yield from 18.9 to 18.8 per cent. of ash and from 0.0896 to 0.1012 per cent. of total alkaloid. The flowering tops of *H. niger* annual lose 85.06 per cent. of moisture upon drying, yield from 11.41 to 11.66 per cent. of ash and from 0.1301 to 0.1561 per cent. of total alkaloid. The flowering tops of *H. niger* annual var. *pallidus* lose 84.8 per cent. of moisture upon drying, yield

from 11.99 to 12.33 per cent. of ash and from 0.1243 to 0.1301 per cent. of total alkaloid. All samples reported upon were prepared from plants cultivated in the Medicinal Plant Garden, College of Pharmacy, University of Minnesota.

Some Notes on Sandalwood, Its Assay, Yield of Oil, and Changes in the Oil during Distillation: C. H. Briggs.

Iso-pulegol Phosphonic Acid: Francis D. Dodge.

The writer has made a further examination of the crystalline acid, containing phosphorus, resulting from the reaction of phosphoric anhydride on citronellal.

The compound is very stable, and yields a series of well-crystallized salts. By dry distillation of the sodium salt, a volatile alcohol was obtained, apparently identical with the iso-pulegol of Tiemann, a cyclic isomer of citronellal. The acid is then most probably a phosphonic acid of iso-pulegol, and hence a very characteristic derivative of citronellal.

Attempts to demonstrate the presence of citronellal in oil of lemon, by means of this reaction, were unsuccessful.

Note on the Use of the White Mouse as a Test Animal for Determining the Toxic Coefficients of Various Drugs: J. H. Beal, C. G. MacArthur and E. A. Doisy.

Color Standards and Colorimetric Assays: H. V. Arny.

Electrolytic Determination of Mercury in Mercury Oleate: B. L. Murray.

Electrolytic Determination of Bismuth in Bismuth Betanaphthol: B. L. Murray.

Electrolytic Determination of Mercury in Mercury Salicylates: B. L. Murray.

A rapid and convenient method of determining mercury in mercury salicylates is herewith presented. It consists in a new application of the already well and favorably known electrolytic deposition of mercury. The method here given as used on salicylates of mercury has been in use about two years and has proved reliable.

About 0.3 gram is weighed into the mercury cathode dish and dissolved in 10 c.c. of sodium sulphide solution (sp. gr. about 1.18). To this solution are added 20 c.c. of 10 per cent. potassium hydroxide solution. The mixture is now electrolyzed, using a current of 1 ampere and 7 volts until the mercury is completely deposited; usually about one half hour being required. The anode should rotate about 500 revolutions per minute. After the deposition the electrolyte is decanted, the mercury is washed with water until free from alkalinity, then with alcohol, finally with ether, and then weighed.

Hardness, Weight and Thickness of Medicinal Tablets: A. D. Thorburn.

The Rate of Evaporation of Ether in Oil-Ether Anesthesia: Chas. Baskerville.

The Identification of the Emodin Containing Drugs: Geo. D. Beal and Ruth E. Okey.

Some New Laboratory Methods: Albert Schneider.

DIVISION OF ORGANIC CHEMISTRY

F. B. Allan, Chairman

C. G. Derick, Vice-chairman and Secretary

The Chemistry of Enzymic Action: J. U. Nef.

The First of the Enzymes and Its Evolutionary Significance: R. G. Eccles.

(1) The prototrophic bacteria as the most primitive known organisms on the earth.[2] Metabolism of *Nitroso-coccus* of South America, and *Nitoso-monas* of Europe (Fischer, p. 104). (3) The first known exothermic reaction among the elements. Nitrogen as an acid and base forming element (HNO_3, N, NH_3). (4) Nitric oxide in the metabolism of nitrite bacteria. A substitute for sunlight. (5) Oxidases as peroxides. Autoxidation through iron, phosphorus and manganese. (6) Hydrolysis as related to oxidases. The too often overlooked difference between organic and inorganic hydrolysis and hydrosynthesis. The union of an inorganic acid and base and the union of amino acids very significantly *unlike*. As *generally interpreted* the $\overset{+}{H}$ and $\overset{-}{HO}$ ions of the two cases are reversed from one another. (7) Nucleic acid as probably related to enzyme action. (8) The co-enzymes and specificity.

A New Form of Absorption Bottle for Use with either Calcium Chloride or Soda Lime in Organic Combustion: H. L. Fischer.

Spectrophotometric Study of Copper Complexes and Biuret Reaction: P. A. Kober and A. B. Haw.

The absorption spectra of the copper complexes of amino acids, peptides and proteins were studied quantitatively, by means of a Hilger sector photometer and a spectroscope.

The results—the nature and amount of absorption—are in harmony with the theory of biuret reaction of Kober and Segiura.

[2] Brit. Encyclop., New Edition, Vol. 3, p. 165; Lafar's ''Tech. Mycol.,'' Vol. I., p. 380; Fischer's ''Structure and Functions of Bacteria,'' p. 51.

The Constitution of the Three Nitro-a-carbopyrrolic Acids: W. J. HALE.

The Oxidation of Ethyl Alcohol with Alkaline Potassium Permanganate: W. L. EVANS AND J. E. DAY.

The Oxidation of Certain Lactates with Potassium Permanganate: W. L. EVANS, P. A. DAVIS AND P. COTTRINGER.

Condensation Products of Menthane formed by the Action of Aluminum Chloride: GEO. B. FRANKFORTER AND A. L. NEWMAN.

In view of the fact that aluminum chloride has been found to act as a condensation agent on the various hydrocarbons in the presence of oxygen compounds as aldehydes and ketones, it was tried on menthane, first in the presence of hydrocarbons, and later it was tried on menthane alone. In the former case benzene was used with menthane. A substance was formed which did not contain oxygen. Analysis indicated that it was a tetranuclear compound containing two molecules of menthane and two benzene radicals. A bromine derivative was prepared. A condensation product was made from menthane alone. Analysis indicated that it was likewise a tetranuclear substance containing four menthane radicles. Bromine compounds were also prepared. Nothing as yet has been learned of the molecular structure.

The Polymers of Pinene: G. B. AND C. J. FRANKFORTER.

Pinene tends to form complex resinous substances when treated with any of the halogen elements, as chlorine, bromine or iodine in addition to the formation of hydric salts. Not only do the elements themselves react with pinene, but also certain of their salts. Thus chlorine or aluminium chloride added cautiously to pinene forms resinous substances in addition to the hydrochloride and tarry matter. The resinous matter thus formed was found to be a complex substance. Two definite substances have been isolated and carefully studied, while a third doubtless exists. Analysis of the two which have been studied indicate the formula $(C_{10}H_{16})_2$ and $(C_{10}H_{16})_4$.

The Electron Conception of Valence. A Laboratory Search for Electromers: OLIVER KAMM.

The electron conception of valence as advocated by Falk, Nelson and others predicts three isomers in many cases where the theory of cis-trans isomerism demands only one or two. An extensive search was therefore made in order to isolate some of these missing isomers. It has, however, been possible to explain all of the results obtained on the basis of the atomic linking theory without using the electronic formulæ for the double union.

The Rearrangement of (N) Alkyl Anilines: C. G. DERICK AND J. W. HOWARD.

The action of heat upon methyl aniline was studied. No change was observed up to 500°. Similar results were obtained with dimethyl aniline.

The action of heat upon the methyl aniline hydrochloride has been thoroughly studied. Under temperature of 250° no shifting of the methyl group from the side chain nitrogen atom to the ring carbon atom was found. On the other hand, the percentages of the primary, secondary and tertiary amines was found to be constant within the temperature limits 200°–250°, the times of heating two to forty-eight hours, and the volume of the bomb tubes. No quaternary compounds were detected. The primary, secondary and Tertiary amines were proven to be aniline, monomethyl aniline and dimethyl aniline, respectively. At 300° the reaction is very different. The methyl radical shifts from the nitrogen atom to the carbon atom of the ring.

The Synthesis of 1-Phen-3-Phenoxy-Propane by the Grignard Reaction: C. G. DERICK AND L. O. POTTERF.

For the preparation of the 1-phen-3-phenoxy-propane, phenyl magnesium bromide was prepared in the usual manner. The solvent ether was evaporated off on a water bath. The residue was dissolved in one and one half moles of phenetol and one mole of the 1-bromo-3-phenoxy-propane added. The solution was now heated slowly to the boiling-point under an air-condenser, when the last traces of ether were slowly driven off. This heating requires about an hour and is followed by three hours refluxing. The yield of the 1-phen-3-phenoxy-propane was 47 per cent., while if a few drops of dimethyl aniline were added the yield was increased to 61 per cent.

The Isomeric Tetracetates of Xylose and Observations regarding the Acetates of Melibiose, Trehalose and Sucrose: C. S. HUDSON AND J. M. JOHNSON.

The Preparation of Melibiose: C. S. HUDSON AND T. S. HARDING.

A Second Crystalline d-Fructose Pentacetate (a-d-Fructose Pentacetate): C. S. HUDSON AND D. H. BRAUNS.

Bromoacetylxylose and Beta Triacetylmethylxyloside: J. K. DALE.

An Undissociated Organic Acid in the Rôle of a Catalytic Agent: H. C. BIDDLE.

In the inversion of sugar and in the hydrolysis of esters in the presence of acids, the speed of the reaction is a direct function of the concentration of the hydrogen ions. In the conversion of cinchona alkaloids into their toxins, however, we are dealing with a catalysis in which the hydrogen ion acts as an inhibiting agent and the positive catalyst is the undissociated molecule of an organic acid.

The Isomerism of 1, 4, 5, 6, Tetrahydroxynaphthalene: A. S. WHEELER AND V. C. EDWARDS.

Naphtazarin on reduction with stannous chloride and hydrochloric acid yields 1, 4, 5, 6, tetrahydroxynaphthalene, yellow, melting at 154°. It dissolves in alcohol, but deposits deep red crystals, also melting at 154°, which possess the same empirical formula and do not even differ in structure so far as the experiments of Zincke and Schmidt and ourselves indicate. We find, however, that the yellow compound, always considered a phenol, is also a ketone and must be included among the keto-enol compounds. We obtained excellent yields of ketone derivatives with semicarbazine, phenylsemicarbazine, and four other similar reagents. No oxime could be prepared on account of the sensitiveness of this phenol to basic reagents. According to whether we used one or two molecules of phenylsemicarbazine, we get a mono- or a diphenylsemicarbazone. Acetylation gives a high yield of a tetracetyl derivative. The isomers themselves we have been unable to separate.

The Bromination of 1, 4, 5, 6, Tetrahydroxynaphthalene: A. S. WHEELER AND V. C. EDWARDS.

This phenol is readily brominated, best in glacial acetic acid solution, a dibromdihydroxyquinone being formed. If the bromination is carried out in hot acetic acid, the product contains two less H atoms. These products are very slowly acetylated with acetyl chloride and this made the starting-point of two series of derivatives whose character can not be indicated in a short abstract. Naphtazarine was also brominated and yielded a series of derivatives which assisted in determining the structure of members of the above series.

Simple and Mixed Alkyl Phosphates: W. A. DRUSHEL.

1. The alkyl phosphates are very stable at room temperature in $N/10$ HCl, but are rapidly saponified by barium hydroxide.

2. All alkyl groups are hydrolyzable, the first more easily than the second and third.

3. In mixed alkyl phosphates one alkyl group is not hydrolyzed to the exclusion of the other, contrary to Lossen and Köhler's theory.

4. These esters are distillable in vacuo without decomposition.

On the Preparation and Properties of Hydracrylic Esters: W. A. DRUSHEL AND W. H. T. HOLDEN.

Hydracrylic acid is obtained from glycerine through B-iodopropionic acid by the removal of hydriodic acid from the latter by silver oxide. It is easily esterified with common alcohols in the absence of mineral acids by using anhydrous copper sulphate. The yields of esters are from 80 per cent. to 90 per cent.

The hydracrylic esters are all colorless, with a faint but characteristic odor, mostly readily soluble in water, all below isoamyl hydracryate are heavier than water and all boil with decomposition at atmospheric pressure but are distillable under diminished pressure without decomposition.

On the Synthesis of Glycocoll and Diethyl Carbonate: W. A. DRUSHEL AND D. R. KNAPP.

A modification of the method of Kraut for the preparation of glycocoll. The yield is the same as that obtained by Kraut (55 per cent.).

Nef's method for the preparation of diethyl carbonate is modified. Diethyl carbonate boils at 127°. The specific gravity at 25° is 0.968 and the saponification equivalent is 59.

Further Studies upon the Resene of Pinus Heteropylla: CHAS. H. HERTY AND V. A. COULTER.

The Occurrence of Inosite Triphosphoric Acid in Cottonseed Meal: J. B. RATHER.

An inosite phosphoric acid corresponding in composition to inosite triphosphoric acid, $C_6H_6(OH)_3(H_2PO_4)_3$, has been separated from cottonseed meal by means of its crystallin strychnin salt. This confirms the previous work of the author on the composition of the acid in so far as it indicates that cottonseed meal contains an inosite-phosphoric acid much richer in carbon and poorer in phosphorus than the so-called phytic acid $C_2H_8P_2O_9$. These results are not in accord with the view that the principal inosite phosphoric acid of cottonseed meal is inosite hexaphosphoric acid $C_6H_6(H_2PO_4)_6$, although it is possible that the present acid is a hydrolytic product of that substance.

Baly's Theory of Chemical Reactions: W. M. DEHN.

Study of the Common Bean: W. M. DEHN.

A Case of Steric Hindrance in Enzymes: W. M. DEHN.

Colorimetric Studies of Picrate Solutions: W. M. DEHN.

Certain Non-interchangeable Radicals: W. M. DEHN. CHARLES L. PARSONS,
Secretary