

are three hundred others, on the shores of the same body of water, whose subsidence should be similarly investigated to make possible a final determination of the age of the culture of this region; and this is only one region of many where similar archeological phenomena can be studied. The cry of the physical anthropologist is for more material—material which is in part no longer obtainable. The ethnologist is beset by the same difficulty. There is not a people in the state whose institutions and religion have been ascertained with such exhaustiveness as is desirable for purposes of comparisons alone. We know that the Maidu and Wintun had certain ceremonies in common. It now appears that other groups, such as the Pomo and Miwok, also practised certain of these ceremonies. We have some idea of the form which these ceremonies took among the Maidu, with whom they do not seem to have been original; but we lack almost all knowledge regarding them among other tribes—and this is knowledge which can still be secured. There is no doubt that something of the history of the aborigines of California, in broad outlines, but in the specific sense of the word history, will be revealed by the continued pursuit of the various phases of anthropology; but what is needed in all domains of the anthropology of the region is more knowledge, more information, and more facts. However gratifying the results of research have so far been, they show only more clearly the greater results that are possible, and emphasize the means by which alone these results can be attained, which is: more work.

A. L. KROEBER

THE AMERICAN CHEMICAL SOCIETY AND  
SECTION C OF THE AMERICAN ASSO-  
CIATION FOR THE ADVANCEMENT  
OF SCIENCE

THE thirty-seventh general meeting of the American Chemical Society and the

meeting of Section C of the American Association for the Advancement of Science was held at Chicago during Tuesday, Wednesday, Thursday and Friday, December 31 to January 3, in the Kent Chemical Laboratories of Chicago University.

Tuesday morning the organization of Section C was effected and this was followed immediately by the opening session of the American Chemical Society and later by the meetings of the sections.

On Tuesday evening a complimentary smoker was extended to the visiting chemists by the Chicago section of the American Chemical Society at the Sherman House. The cordiality and good cheer of the occasion were so much in evidence that this session extended well over into the new year.

Wednesday afternoon personally conducted excursions were made to the Illinois Steel Company, the By-products Coke Corporation, the American Linseed Company and the Chicago Gas light and Coke Company.

In the evening the society was favored by an address on "American Chemical Societies" by Professor M. T. Bogert, president of the society.

Thursday evening the members of the society banqueted at the Auditorium Annex Hotel. This was one of the most enjoyable events of the thirty-seventh general meeting.

On Friday afternoon excursions were conducted through the plants of the Standard Oil Company at Whiting, Indiana, and to the Union Stock Yards and the packing plant of Swift & Company. A complimentary luncheon was served for the visitors by Swift & Company.

At the last general meeting, on Friday, the society extended a vote of thanks to the Chicago section and all others who contributed so much for the success of the meeting in Chicago.

The attendance at this meeting reached 325, almost the largest in the history of the society.

The following papers and addresses were delivered before the general sessions:

*The Application of Physical Chemistry to Organic Chemistry:* JULIUS STIEGLITZ.

*The Hydronitrogens and their Derivatives:* A. W. BROWNE.

*A Plea for the Broader Education of the Chemical Engineer:* CLIFFORD RICHARDSON.

*Some Present-day Problems of Biological Chemists:* R. H. CHITTENDEN.

*The Passage of Substances into the Human System by Osmosis:* LOUIS KAHLENBERG.

*American Chemical Societies:* M. T. BOGERT.

*The Non-equivalence of the Four Valences of the Carbon Atom:* J. U. NEFF.

*The Chemical Education of the Chemical Engineer:* WM. H. ELLIS.

*Chemistry in the Government Service:* W. D. BIGELOW.

*The Interrelations of the Elements:* HERBERT N. MCCOY.

The following papers were presented before the different sections:

#### PHYSICAL CHEMISTRY SECTION

*Herbert N. McCoy, Chairman*

*On the Passage of Substances into the Human System by Osmosis:* LOUIS KAHLENBERG.

The experiments began with a study of the treatment of cases of blood-poisoning by means of saturated aqueous solutions of boric acid. In all cases where such solutions are applied to the thoroughly cleansed skin, boric acid is absorbed and makes its appearance in the urine. The percentage found in the urine rarely

reaches more than a few hundredths of one per cent.

A large number of pathological samples of urine were examined, their boric acid content being determined colorimetrically by means of a modification of the turmeric paper method. When the feet of a normal individual are immersed in a saturated boric-acid solution up to the ankle, the boric-acid appears in the urine in estimable quantity in ten minutes. The presence of traces may be demonstrated after five minutes. Under like conditions not a trace of lithium passes into the system from lithium chloride solutions. Quite weak solutions and also five and ten per cent. solutions were tried. Chlorides of calcium and rubidium also do not pass into the system. The tests were made by means of the spectroscope. It is a notable fact that through dead animal or vegetable membranes lithium chloride will pass much more rapidly than will boric acid. And when even a small fraction of a grain of lithium chloride is taken into the mouth, the lithium may be demonstrated to be present in the urine in a very short time. When the feet are soaked in a solution of lithium tetraborate, neither lithium nor boric acid is found in the urine. Thus far all attempts to introduce lithium salts into the system by absorption through the skin have been unsuccessful. On the other hand, through the mucous membranes lithium salts readily make their way. Through dead animal and vegetable membranes acids diffuse most rapidly. When the feet are soaked in a tenth normal hydrochloric or sulphuric acid, the urine, which, as is well known, is slightly acid in reaction normally, becomes alkaline in five minutes, also scanty as to amount. In ten minutes the alkalinity is much more pronounced. If now the experiment is stopped, the alkalinity persists for three to five hours longer, gradually disappearing. An attempt to secure the

same results with citric acid failed, the urine showing, if anything, a slight increase of acidity. Even a half normal solution of citric acid produced the latter effect. When taken internally, the acids mentioned acidify the urine. Thus it appears that when, for instance, sulphuric acid is taken in through the skin quite a different physiological effect is produced from that found when the acid is taken into the digestive tract.

The work demonstrates clearly that living membranes act differently osmotically from dead ones, and that different living membranes may act very differently indeed toward some substances and yet much the same toward others. Whether a substance will be absorbed or not depends upon its specific nature and that of the membrane. The results of the experiments are a step forward toward a better understanding of the processes of absorption and secretion.

*On the Refractive Indices of Absolute and of Aqueous Alcohol:* LAUNCELOT ANDREWS.

Absolute alcohol prepared by the use of calcined marble has the same density, the same refractive index and the same critical temperature of solution as that which has been dried by the use of metallic calcium or of magnesium amalgam.

The observations of Caismer to the effect that the critical temperature of solution of absolute alcohol in kerosene is the best criterion of the dryness of alcohol is fully confirmed.

Absolute alcohol was found to have the following constants:

Density . . . . .	25°/40°	0.78510	0.00002
Zeiss immersion refractometer,			
	85°/30	0.02	at 25° H
Index of refraction . . . .	1.35941	0.00002	25° H

A table is presented, showing the refractive indices by the Zeiss immersion

refractometer readings of aqueous alcohols for each per cent. of water from 0 to 30.

It is shown that aqueous alcohol has a maximum refractive index of 1.363315 0.000010 at 20.7 per cent. of water, corresponding to the formula.

*On the Refractive Indices of Ether Alcohol Mixtures:* LAUNCELOT ANDREWS.

It is in general possible to determine the concentration of the solution of an organic substance in an organic solvent more rapidly by an observation of the refraction index than by the density. This is eminently so when the observation is made by the Zeiss immersion refractometer, which is frequently possible when the solvent is ether, alcohol or especially methyl alcohol.

Having occasion to determine the ether content of the mixtures named in the title by wholesale, a table was constructed showing the Zeiss constants for mixtures of absolute ether with aqueous (91 per cent.) alcohol, over the range from 100 to 84 per cent. of ether.

This table is given in the paper, together with a description of the experimental work on which it is based.

*The Latent Heat of Vaporization of Methyl Silicate:* LOUIS KAHLENBERG and ROBERT KOENIG.

Methyl silicate was prepared by treating silicon tetrachloride with absolute methyl alcohol. The pure product was found to possess a latent heat of vaporization of 46.48. Its specific heat between 23° and 115° C. was found to be 0.5011. The liquid boiled at 121° C. under 750 mm. pressure. The latent heat of silicon tetrachloride was redetermined and found to be 36.1. The value determined by Andrews was 37.3. The specific heat of silicon tetrachloride was found to be 0.1904 between 40° and 25° C. This agrees well with the value found by Regnault.

*Equilibrium in the System Silver Nitrate and Pyridine:* LOUIS KAHLBERG and ROBERT K. BREWER.

The entire curve of equilibrium was determined from the freezing point of pyridine  $-48.5^{\circ}$  to  $110^{\circ}$  C. From  $-65^{\circ}$ , the freezing point of the saturated solution to  $-24^{\circ}$  a solid of the composition  $\text{AgNO}_3 \cdot 6\text{C}_5\text{H}_5\text{N}$  is in equilibrium with the solution. From  $-24^{\circ}$  to  $+48.5^{\circ}$  the solid in equilibrium with the solution is  $\text{AgNO}_3 \cdot 3\text{C}_5\text{H}_5\text{N}$ . From  $+48.5^{\circ}$  to  $+79^{\circ}$ ,  $\text{AgNO}_3 \cdot 2\text{C}_5\text{H}_5\text{N}$  is in equilibrium with the solution; and above the latter temperature pure  $\text{AgNO}_3$  is in equilibrium with the solution.

*Note on the Solubility Product:* JULIUS STIEGLITZ.

Arrhenius's work (*Zt. phys. Ch.*, XXXI, 197) on the solubilities of silver salts of the fatty acids in the presence of sodium salts of the same acids destroyed the last vestige of the theoretical foundation of the solubility product constant by showing that the solubility  $C_{\text{mo1}}$  of the non-ionized salts is not a constant, but decreases with the increased concentration of salt solutions. A decreasing molecular solubility  $C_{\text{mo1}}$  and an increasing value for  $C' \times C/C_{\text{mo1}}$  as is found for strong electrolytes is consistent with a constant solubility product  $C' \times C$  and the author shows that satisfactory constants are obtained for each of the silver salts by calculation from the data of Arrhenius. Such a constant, even if only an empirical and not a natural constant, is of great practical value in work on solubilities.

*Two New Methods of Determining the Secondary Ionization Constants of Dibasic Acid:* HERBERT N. MCCOY.

1. The concentration of the free acid in an aqueous solution of the normal and acid sodium salts of a weak dibasic acid is

found by partition with an immiscible solvent. Titration of the aqueous solution gives the remaining data for the calculation of the ionization constant of the second hydrogen ion.

2. This same constant may also be calculated from the values of the equivalent conductances of very dilute solutions of the normal salt and the acid salt. The results of the two methods agree with one another and also with those obtained by other methods as well as could be expected.

*The Preparation of Urano-uranic Oxide and a Standard of Radioactivity:* GEO. C. ASHMAN and HERBERT N. MCCOY.

Pure UO is obtained by igniting pure uranyl oxide in an electric muffle at  $650$  to  $700^{\circ}$  C. At much lower temperatures decomposition is incomplete, at higher temperatures oxygen is slowly lost. Standards of radioactivity consist of films of the oxide UO about 40 sq. cm. in area and 0.7 to 0.9 g. in weight, deposited by a special process, on flat, circular plates of copper. Films so made having equal area, have identical activity. The ray activity due to 1 sq. cm. of such a film is taken as the unit of radioactivity.

*The Three Component System—CuO, SO<sub>3</sub>, H<sub>2</sub>O at 25 Degrees:* J. M. BELL and W. C. TABER.

Purified copper oxide or copper hydroxide was added in excess to a solution of copper sulphate, and the solid and liquid phases analyzed for copper and sulphuric acid after the system had come to equilibrium. In plotting the results on a triangular diagram, by joining the corresponding points of the solid and liquid phases, it was found that the lines did not meet within the triangle, indicating that the solid phases consist of a series of solid solutions, and are not definite chemical compounds of the nature indicated by the

formulas,  $5\text{CuO} \cdot 2\text{SO}_3 \cdot 5\text{H}_2\text{O}$  and  $4\text{CuO} \cdot \text{SO}_3 \cdot 4\text{H}_2\text{O}$ , which have the best status in the literature of the basic sulphates of copper.

When sulphuric acid was added in excess to solutions of copper sulphate, the lines joining the corresponding points representing the solid and liquid phases pass through points representing the penta-, tri- and mono-hydrates of copper sulphate. At still greater concentrations of acid the anhydrous salt is the stable solid phase. The vapor pressure at which any two of these hydrates exist at 25 degrees, as found by Lescoeur and others, agrees well with the calculated vapor pressure of the solution at the corresponding invariant points.

*The Action of Nitric and Citric Acid Solutions upon Ferric Hydroxide:* F. K. CAMERON and W. O. ROBINSON.

At 25° nitric acid dissolves a little more than its own equivalent of ferric oxide with the formation of a definite solid solution of ferric oxide, nitric acid and water.

From concentrations of nitric acid from 30 to 45 per cent.  $\text{N}_2\text{O}_5$  the 18-hydrate of the normal salt exists. In a metastable condition it exists to a concentration of 55 per cent.  $\text{N}_2\text{O}_5$ . The stable solid from concentration 45 per cent. to 55 per cent.  $\text{N}_2\text{O}_5$  is an acid salt of the formula  $\text{Fe}_2\text{O}_3 \cdot 4\text{N}_2\text{O}_5 \cdot 20\text{H}_2\text{O}$ .

Oxalic acid dissolves more than its own equivalent of iron oxide at 25° with the formation of a solid solution of oxalic acid, ferric oxide and water.

*The Rate of Diffusion of Oxygen through Organic Liquids:* G. B. FRANKFURTER and G. W. WALKER. Reported by title.

*The Casting of Zinc:* W. D. BANCROFT. Reported by title.

*Solution in a Dissolved Solid:* CHARLES L. PARSONS. Reported by title.

*Reversed Electrolysis:* J. W. TURRENTINE. Reported by title.

*Principles Involved in the Construction of College Laboratories:* CHARLES BASKERVILLE. Reported by title.

*The Heat of Ionization and the Reversible Potential of Nickel:* E. P. SCHOCH. Reported by title.

#### AGRICULTURAL, SANITARY AND FOOD CHEMISTRY SECTION

W. D. Bigelow, Chairman

*Determination of Sulphites in Food Products:* EDWARD GUDEMAN.

Paper recommends the use of steam for distillation of sulphurous acid. Acid solutions of food products on concentration or during distillation are liable to be decomposed and sulphur compounds naturally found in the products, distilled over and oxidized and reported as sulphites or sulphurous acid present. Method of using steam prevents such concentration and decomposition. Results reported on fresh meats, gelatine and eggs. Advantages of method that distillate can be directly titrated with iodine solution for sulphurous acid, no danger of bumping or frothing of solutions and no decomposition of products due to concentration of acid solutions. Description of apparatus used for distillation.

*Natural and Modified Starches; An Introduction to a Comparative Study of their Physical and Chemical Properties:* CHESTER B. DURYEA.

The author outlines an effort to decide whether or not starches are essentially homogeneous chemically. Modified starch is defined. Various methods of preparation are given, and also the more conspicuous phenomena resulting from the "in suspension" and "drying in" processes, which are stated to differ in their effects on the granules because of stratification conditions. Opposing elements in old views involving chemical homogeneity

of the granules, and the new hypothesis of the fundamentally different components amylopectin and amyloses are set forth. Objection is made to the indirect methods of previous investigators. The author's scheme of experimentation is explained in detail, and general reference is made to results so far had, which indicate that the new amylo-pectin hypothesis is untenable. The investigation in detail will be published later.

*Note on the Dyer Method for the Determining of Plant Food in Soils:* FRANK T. SHUTT and A. T. CHARRON.

The authors have submitted the results of an investigation of the influence of time of digestion and the influence of volume as related to the Dyer method for determining plant food in soils. From the results there is every reason for adherence to the time and volume limits as given by Dyer in his original account of the process.

*A Recent Analysis of Water from Great Salt Lake:* W. C. EBAUGH and KENNETH WILLIAMS.

From analyses made in this laboratory we know that the water of Great Salt Lake has varied widely in composition during the last twenty years, as indicated by the following partial results.

Year	Density at 15° C.	Per cent. by Weight, Total Solids
1885 .....	1.1225	16.716
1903 .....	1.2206 <sup>1</sup>	27.721 <sup>1</sup>
1907 .....	1.1810	22.920

The solids contain the following constituents:

	Per cent. by Weight of Sample	Grams per Liter
Chlorine .....	12.67	149.633
Sulphate radical ..	1.53	18.069
Sodium .....	7.58	89.520
Potassium .....	0.72	8.503
Magnesium .....	0.45	5.314
Calcium .....	0.04	0.508
Total solids (direct determination) ..	22.92	270.675

<sup>1</sup> Greatest density ever recorded.

*The Precipitation Method for the Estimation of Oils in Flavoring Extracts and Pharmaceutical Preparations:* CHARLES D. HOWARD.

The author proposes a modified precipitation method for determining oils in flavoring extracts and this modified form yields very accurate results. No correction for oils retained in solution is necessary, alcoholic solutions are not detrimental except for almond oil. A determination may be made in less than ten minutes.

*Effect of Lime and Gypsum on the Solubility of Potassium in Feldspars:* F. W. MORSE and B. E. CURRY.

Lime and gypsum in contact with feldspar increases the solubility of potassium. This effect has not been detected when ordinary clay soils are treated in a similar way. This difference is probably due to the absorbing action of the clays which causes the removal of potassium from solutions.

*A Study of the Changes Taking Place in the Muscle of Chickens when Preserved at Low Temperatures:* M. E. PENNINGTON and E. Q. ST. JOHN, Food Research Laboratory.

The muscular tissue of chickens kept in a solidly frozen condition, at 13° F., shows marked histological changes even after one month in cold storage. These changes are progressive and at the end of six months many muscle fibers are scarcely recognizable.

The observations have been made on chickens of known history and which have been carefully kept, and upon chickens of the ordinary market type. The latter have been examined after storage periods of two and three years, as well as when stored for comparatively short lengths of time.

*Methods of Soil Toxicology:* OSWALD SCHREINER and EDMUND C. SHOREY.

The presence of small amounts of toxic

organic bodies in soils demands methods for their detection, isolation and study. Their presence and toxic properties are determined by physiological methods in which plants are employed. The isolation and identification must be done by chemical methods, employing the methods of toxicology and of biological and organic chemistry. The authors outlined methods of separating the organic matter from the large mass of inorganic material, and further separation of the pure organic body from the extraneous organic matter by methods of extraction, solution, precipitation, distillation, etc. The specific methods by which several harmful organic compounds have already been isolated from unproductive soils were given to illustrate the general principles involved.

*Nitrates as Soil Renovators:* OSWALD SCHREINER and HOWARD S. REED.

Attention is called in this paper to an action of nitrates in aiding the destruction of harmful organic bodies which may be present in unproductive soils. After nitrates have acted in such a soil or soil extract, the conditions for plant growth are improved, although the nitrates have been used up by a previous crop. Roots of plants possess a strong oxidizing power and it has been found that this power is greatly augmented by nitrates, so that the oxidizing power under such conditions becomes sufficiently great to destroy harmful organic bodies, resulting in improved conditions for plant growth. When known toxic bodies are used in the experiments, their destruction by the plant and nitrates can be shown by chemical analysis.

*The Proteids of Cotton:* H. C. WHITE.

This paper presents the results of the first of a proposed series of observations upon the nitrogen feeding of the cotton plant. During the season of 1907 analyses were made of pot-grown and field-grown

plants, from sprouting to maturity, to determine the extent and character of the nitrogen compounds. The actual nitrogen content, at comparatively short intervals of growth, is shown and some valuable suggestions gained on which to base future studies of the development of the nitrogen compounds. The investigation will be continued through the coming season.

*The Volatilization of Certain Mineral Elements in Ashing Plant Materials:* W. W. SKINNER, U. S. Department of Agriculture.

The usual method for determining the mineral matter in plants has been to ash the material and submit the ash to a complete mineral analysis; this presupposes that all of the mineral elements in the plant are retained in the ash, an assumption which for a long time has been known to be incorrect.

This work was undertaken to show to what extent sulphur, phosphorus, chlorine and potash are lost by the ordinary method of incinerating in air, and to point out the possibility of faulty conclusions resulting from the attempt to establish the relation of plant growth to the mineral elements in the soil from ash analyses which do not show all of a certain mineral element in the plant, a portion of it being volatilized in the process of ashing.

This paper gives results upon sulphur only, and shows the loss when ashed by the ordinary method as compared with the total sulphur obtained by the peroxide and the combustion in oxygen methods.

Analyses are given of two samples of cotton seed meal, two samples of mustard seed meal, three samples of malt, four samples of barley and three samples of wheat. The loss of sulphur varies from 89 per cent. to 97 per cent.

*The Occurrence of Copper in Oysters:* J. T. WILLARD.

Illness having followed eating oysters of a decidedly bluish green color, an analysis disclosed the presence of copper to the extent of 0.212 per cent. of the dry substance in one instance. Other tests of fresh and canned oysters on the Kansas market showed copper to be present in every case. Twenty-six samples from various localities were secured directly from the shells, and copper found in every instance, the average amount in the dry substance being 0.059 per cent. Copper seems, therefore, to be a normal constituent of oysters, and it is probable that some individuals may be affected by it when present in the larger amounts.

*Influence of Fertilizers upon the Composition of Wheat:* HARRY SNYDER.

Nitrogen, phosphorus, and potassium containing fertilizers, singly and in combination, were applied to wheat, and complete proximate analyses were made of the crop, and a study was made of the influence of the nitrogenous fertilizers upon the amount and form of the nitrogenous matter in the wheat. Milling and technical tests were also made of the wheat, and bread-making tests of the flour. Over forty samples of wheat were included in the investigation. The results show that an increase in nitrogen content of wheat can be secured by the use of nitrogenous fertilizers, but that the additional nitrogen is not all in the form of gluten proteids, a portion of the nitrogen being in the form of amides, nitrates and allied forms. The influence of the fertilizers upon the commercial and bread-making value of the wheat is also briefly discussed. In general an improvement in the quality of the grain was secured by the use of fertilizers.

*The Detection of Formic Acid in Food Products:* A. G. WOODMAN and ALBERT L. BURWELL.

The authors have obtained very satis-

factory results in detecting formic acid used as a food preservative by means of a method based on the dry distillation of calcium formate.

The method used may be described briefly as follows: Fifty grams of the sample are mixed with 20 c.c. of 20 per cent. phosphoric acid and distilled by steam.

To the distillate is added 2 c.c. of 30 per cent. acetic acid free from formic acid, and about 20 c.c. of milk of lime (100 grams CaO per liter). The solution is evaporated to small bulk over a free flame and then on the water bath to dryness.

The dry residue is scraped into a test-tube provided with a cork and bent delivery tube and subjected to dry distillation. After the delivery tube has been allowed to drain, 3 c.c. of standard fuchsin aldehyde reagent is added to the distillate, the mixture allowed to stand exactly five minutes and compared with a standard color.

The fuchsin-aldehyde reagent is prepared by dissolving 0.2 gram rosaniline in 10 c.c. of freshly prepared *saturated* sulphurous acid and allowing the solution to stand until the red color has entirely disappeared and only a light straw tint remains. This is diluted with 200 c.c. of distilled water.

*An Electrically Heated Polariscopic Tube:* B. H. SMITH.

The tube consists of a fairly heavy inner tube of brass or other metal of one half inch inside diameter, the ends of which are threaded and capped as in the case of the usual form of polariscopic tube. An aperture, equally distant from either end, is threaded to receive a short wide-mouthed tube at right angles, which admits the thermometer. The latter tube, being removable, as is also the binding screw, allows a metallic jacket to slip over and protect the resistance wire. A short



cylindrical sleeve of this jacket fits a groove of the thermometer tube in such a manner as to prevent the possibility of any water getting to the windings. The wire, which is of german silver of 8/1,000 diameter, is put on in layers which are protected from the metallic inner tube and each other by asbestos paper or sheets of mica.

When properly wound, the tube heats up uniformly, the temperature being readily controlled by means of a small rheostat.

*The Effect of Temperature on the Respiration of Apples:* FRED W. MORSE.

The author finds the amount of  $\text{CO}_2$  exhaled at  $10^\circ$  and  $20^\circ$  to be respectively about two and four times the amount exhaled at  $0^\circ$ . This follows the laws of reaction velocity in this respect.

*Some Notes on Soil Acidity:* FRED W. MORSE and B. E. CURRY.

The authors report the reactions taking place between a number of clays and some common salts. Also some reactions between the organic matter in soils and some common salts.

*The Relation between the Effects of Acid in Nutrient Solutions, and of Liming:* BURT L. HARTWELL and F. R. PEMBER.

Field experiments have shown that rye and barley, among the common cereals, are very differently affected by applications of alkaline material. Under conditions resulting in no benefit to rye, liming may increase the yield of barley, 100 to 200 per cent. Comparative water cultures<sup>2</sup> were carried on principally with rye and barley seedlings, to see if the addition of acid to the nutrient solution would affect the barley more injuriously than the rye, as might be surmised from the greater susceptibility of the barley to those conditions which are improved by liming. It was

shown by repeated experiments that barley was *not* injured more than rye by the addition of acid. Growth in the case of both cereals was scarcely affected by an initial acidity equal to  $N/5,000$ , even though the nutrient solution was changed every few days during the three to four weeks of the experiments. A depression of about 20 per cent. occurred, however, when the acidity equaled  $N/2,500$ . An increase in the acidity to  $N/1,700$  and  $N/1,250$ , decreased the green weight about 40 and 60 per cent., respectively.

The growth was not materially influenced by any degree of alkalinity which was insufficient to cause precipitation from an ordinary nutrient solution.

*The Partial Substitution of Potassium by Sodium as a Plant Food:* B. L. HARTWELL, H. J. WHEELER and F. R. PEMBER.

The possibility of an indirect action of sodium in experiments with soil which have been conducted in Rhode Island and elsewhere, precludes an absolute proof of a *direct* beneficial action of sodium upon the growth of plants. This fact led to the growing of wheat seedlings in solution<sup>3</sup> and to the results which are briefly mentioned here. When the seedlings were grown in a nutrient solution containing an optimum amount of potassium there was no increased growth caused by the addition of sodium. When, however, the amount of potassium was reduced so that a depression in growth of about thirty per cent. occurred within a period of about three weeks, the substitution of an amount of sodium equivalent to the potassium which was withheld, caused about a ten per cent. greater growth than when the deficient amount of potassium, but no sodium, was present. An extra amount of calcium did not cause the increase which was produced

<sup>2</sup> Ann. Rpt. Agr. Expt. Sta., 20, 358-380 (1907).

<sup>3</sup> Ann. Rpt. Agr. Expt. Sta., 20, 299-357 (1907).

by the sodium: this fact and others indicate that the increase was not due to greater osmotic pressure. An addition of potassium or sodium increased the transpiration less than the green weight. When supplemented by sodium, a larger amount of potassium was left in the solution by the growing seedlings, showing that sodium was a conserver of potassium.

*A Study of the Chemistry of the Chinese Edible Bird's Nest "Neossin":* E. V. MCCOLLUM.

"Neossin" is a glucoproteid. It gives Millon's, Adamkiewicz's, the biuret and xanthoproteic reactions. It contains 2 per cent. of sulphur, 9.69 per cent. of nitrogen and no phosphorus. Hausmann's method showed the nitrogen to be distributed as follows:  $\text{NH}_3$ , 1.3 per cent.; Humus, 1.27 per cent.; Phosphotungstic acid precipitate, 1.59 per cent.; Amino acids, 5.53 per cent. The substance is remarkable in that about one fourth of its sulphur is liberated as  $\text{SO}_2$  when the proteid is hydrolyzed with 3 per cent.  $\text{HCl}$ . No sulphites are present in the nest. The gas was washed with  $\text{CuSO}_4$  solution and gave no evidence of hydrogen sulphide. The mercaptan sulphur test is very faint.

When boiled with 3 per cent.  $\text{HCl}$ , the carbohydrate group is readily split off. The hydrolysis solution was precipitated with phosphotungstic acid and the filtrate used for the estimation of the sugar by Fehling's solution. It showed the presence of 15 per cent. of sugar calculated as glucose in the sample. This solution gave an osazone which melts at  $183^\circ\text{--}185^\circ\text{C}$ . and has the composition of a hexosazone.

Arginine and histadine were identified in the phosphotungstic precipitate. Lysin appears to be absent.

*The Importance of the Publication of a General Bulletin giving the Results of*

*Food and Drug Work in the United States:* E. H. S. BAILEY and H. L. JACKSON.

It would be a great advantage to those who have to do with the enforcement of food and drug laws if the results of analyses and opinions in regard to certain specific articles of food upon the market were published monthly in some general bulletin. It is of course true that articles might be passed in some states and condemned in others.

This difference might be due to the absence of laws in one state that have been enacted in another. Here the tendency would be to induce manufacturers to raise the grade of goods so as to make use of a common label for all states.

There might be a difference on account of the various methods of examination. If attention is called to this fact there would be thus an opportunity to work out better methods and so obtain more uniform results.

There might also be a different judgment regarding what foods are injurious or otherwise in the separate states. Here again a comparison of results would lead to investigations such as are now being carried on by the Department of Agriculture.

It is suggested that in addition to an official list of laboratories where food and drug analyses are made, there might be a list compiled under various headings, such as flavoring extracts, beverages, etc., giving those that are reported by municipal and state laboratories as being illegal, with a simple statement as to the reason why they are so considered. Although it probably does not come within the province of the federal government to issue such a bulletin, if it could be published in some other way, it would be extremely convenient to those who are engaged in food and drug work.

*Extracting Sugar from Dried Beet Cossettes:* HARRY McCORMACK. Reported by title.

*Analyses of Grains and their Comparative Value for Feeding Purposes:* JOSEPH S. CHAMBERLAIN. Reported by title.

*Changes taking Place in Whisky stored in Wood:* C. A. CRAMPTON and L. M. TOLMAN. Reported by title.

*Detection of Thickeners in Ice-cream:* G. E. PATRICK. Reported by title.

#### INORGANIC CHEMISTRY SECTION

A. W. Brown, Chairman

*Rapid Electroanalysis without Rotating Electrodes:* FRANCIS C. FRARY.

The apparatus described by the author in the November number of the *Journal of the American Chemical Society* (p. 1592) was shown in operation and its construction explained. The object of the apparatus is to provide efficient stirring of the electrolyte during the progress of an analysis without the use of an electric motor or mechanical stirring device. The stirring effect is produced by the action of a magnetic field upon the solution while the latter is being electrolyzed. Two forms of the apparatus were shown, one for use with a wire gauze cathode and the other for a mercury cathode. Details of the construction of the apparatus may be found in the above-mentioned publication.

*A Gas Volumeter with Table of Calculated Values for Carbon Dioxide:* S. W. PARR.

An apparatus combining in one piece the advantages of various forms for evolving and measuring various gases from solids or liquids. The chief feature of the paper is intended to point out the errors existing in values now found in all texts of reference for carbon dioxide varying from 0.3 per cent. to 3.5 per cent. in amount. A cor-

rected value with calculated table for various temperatures and pressure is proposed.

*Atomic Weight of Chlorine:* WM. A. NOYES and H. C. P. WEBER.

A new determination of the ratio between hydrogen and chlorine has been carried out, partly because of the very great importance of the atomic weights of silver and chlorine as a basis for the determination of other atomic weights, and partly because the work could be performed with the use of hydrogen from the same apparatus which was used in the recent determination of the atomic weight of H by one of us. The hydrogen was weighed absorbed in palladium. The chlorine was weighed in the form of potassium chloroplatinate, and the hydrochloric acid was weighed in the first series by absorption in water and in the second series by absorption in water after first condensing it to the solid state by means of liquid air. The ratio found is  $H:Cl=1:35.184$ . This, by combination with the recent value for the atomic weight of hydrogen, determined by one of us, gives the atomic weight of chlorine as 35.461 and the atomic weight of silver as 107.88.

*An Yttrium Group Separation Method:* BENTON DALES and H. D. YOUNG.

The scheme is to dissolve fractionally the rare earth hydroxides in solutions of ammonium salts of organic acids. One series of fractions obtained by the use of cold saturated ammonium acetate solution with material of atomic weight 108 (mostly yttrium, but containing also nearly all the rest of the members of the group) gave five fractions of atomic weights 128, 124, 109, 104, 105. These values are round numbers obtained by the use of a modification of Herrmann's hydrochloric acid titration method. A first fraction contains practically no rare earths, for some reason unknown at present to the authors. The same

material as acetates dissolved fractionally in ammonium acetate solution yielded two fractions of atomic weights 125 and 106.

*Sodium Peroxide in Certain Quantitative Processes:* S. W. PARR.

Fusions by means of sodium peroxide in a closed chamber are shown to have positive advantages in the analysis of substances represented by the following groups. Sulphur and arsenic in pyrites, both iron and copper; sulphur in coal, coke, ashes, etc.; sulphur in rubber, filters and rubber substitutes; halogens, sulphur, arsenic, etc., in organic compounds, especially intended to replace the carius method; silicon and carbon in carborundum.

*The Decomposition of Ores and Metallurgical Products by Means of Sodium Peroxide and Certain Metallic Sulphides:* J. H. WALTON, JR., and A. SCHOLZ.

By mixing certain ores with sodium peroxide and metallic sulphides such as precipitated zinc sulphide, and igniting the mixture, sufficient heat is liberated to completely decompose the ore. The fusion is carried out in a small nickel crucible. It takes place quietly, the decomposition is rapid and the crucible is attacked to an inappreciable extent only.

The method has been used for the decomposition of galena, chrome iron ore, manganese ores, slags, clays and glazes. The results agree closely with those obtained when the standard methods of decomposition are used.

*The Occurrence of Neon in Natural Gas:* H. P. CADY and D. F. MCFARLAND.

The rare element neon has been found in natural gas from southeastern Kansas, along with helium. It is separated in pure condition by fractional absorption in bulbs filled with cocoanut charcoal and cooled with liquid air.

The neon is identified by careful measurement of the lines of the spectrum and comparison with best published measurements. All of the stronger lines have been identified. Besides the lines of neon fifteen fairly strong lines are found which can not be identified as belonging to any of the familiar gases.

These same lines have previously been reported by Dewar in the spectrum of the gas from Bath Springs and also in lists of the lines shown by the more volatile gases from the atmosphere. It is possible that these may represent a new elementary gas.

*A Discussion of Methods in Use for Separations in the Group and a Description of a New Method of Separating these Earths by Use of their Succinates:* V. LENHER.

*Dilution of the Strong Acids and of Ammonium Hydroxide:* C. W. FOULK and H. E. SURFACE.

The authors have prepared tables for sulphuric, nitric and hydrochloric acids and for ammonium hydroxide which give in addition to the usual percentage composition and specific gravity the volume of water to be mixed with one liter of the strong reagent to give a mixture of a called-for specific gravity.

*The Character of the Compound formed by the Addition of Ammonia to Ethylphosphoplatino Chloride* (second contribution): CHARLES H. HERTY and R. O. E. DAVIS.

Further efforts to prepare the completely ionizable chloride described by Rosenheim have proven fruitless. Slight variations from Rosenheim's directions were likewise failures. In every case only that chloride was obtained containing one ionizable chlorine atom. The constitution of this latter compound is in strict accord with Werner's coordination hypothesis.

*The Influence of Temperature on the Electrolytic Precipitation of Copper from Nitric Acid:* JAMES R. WITHROW.

In determining copper in presence of nitric acid by the older electrolytic methods (without agitating the electrolyte) it was found upon a number of occasions that the nearly complete deposits would disappear from the cathode.

The trouble was traced to accidental fluctuations in the temperature. Copper dissolves in nitric acid more readily at elevated than at ordinary temperature. Therefore, if the current strength is sufficiently low the solvent influence of rising temperature soon exceeds the ability of the current to deposit the metal.

The rate of electrolytic precipitation of copper was, therefore, determined at a number of temperatures, using a current of low intensity, so as to find just what this temperature effect was. Preliminary to this, however, it was necessary to determine the rate of precipitation from varying amounts of nitric acid. The most favorable amount of acid was then used in the elevated temperature experiments.

It was found that nitric acid increasingly retards precipitation even from the smallest amounts upwards. The use of small quantities, however, is advantageous because of the beneficial effect on the character of the deposits.

Using 0.2 per cent. (by volume) of nitric acid, it was found that increasing temperature accelerated the precipitation until 60° C. was reached. Beyond 70° C., however, the influence was a retarding one. This "turning temperature" will of course vary with the current strength.

*Action of Certain Oxidizing Agents upon Hydrazine Sulphate:* F. F. SHETERLY. Reported by title.

*The Electrolytic Formation of Selenic Acid from Lead Selenate:* F. C. MATHERS. Reported by title.

*The Reaction Produced by Heat upon a Mixture of Ammonium Chloride and Potassium Bichromate:* G. B. FRANKFORDER, E. V. MANUEL and V. H. ROEHRICH. Reported by title.

*Action of Water on Galvanized Iron:* W. F. MONFORD. Reported by title.

*The Preparation of Silicon Tetrachloride:* CHARLES R. SANGER. Reported by title.

*The Preparation and Properties of Pyrosulphol Chloride and Chlorosulphonic Acid:* CHARLES R. SANGER. Reported by title.

*Recent Improvements in the Determination of Small Amounts of Arsenic and Antimony:* CHARLES R. SANGER. Reported by title.

*The Determination of Small Amounts of Fluorine:* CHARLES R. SANGER.

*Sodium Alum:* W. R. SMITH. Reported by title.

*Some New Compounds of Hydrazine:* J. W. TURRENTINE. Reported by title.

*Fractionation of the Yttrium Earths:* R. D. HALL. Reported by title.

*The Rare Earth Bromates—A New Method of Separation of the Yttrium Earths:* CHARLES JAMES. Reported by title.

*A Scheme for the Separation of the Rare Earths:* CHARLES JAMES. Reported by title.

*A Study of Graphitic Acid:* G. B. FRANKFORDER and LILLIAN COHEN. Reported by title.

B. E. CURRY,  
Press Secretary

(To be continued)