SCIENCE

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THE NEW YORK MEETING OF SECTION C OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND THE THIRTY-FIFTH GENERAL MEETING OF THE AMERICAN CHEMICAL SOCIETY—I.

THE meetings were held in the Havemeyer Chemical Laboratory of Columbia University. On Thursday morning, December 27, Section C was organized with Vice-President Clifford Richardson in the chair.

Dr. H. P. Talbot was elected councilor, Dr. J. H. Long, member of the general committee; Dr. Leonard P. Kinnicutt, member of the sectional committee, and Dr. C. E. Waters, press secretary.

Immediately following this, the opening meeting of the American Chemical Society was held with President W. F. Hillebrand in the chair. Two addresses were delivered: 'The Advisability of Restricting the Use of the Ionic Theory in Teaching Qualitative Analysis,' by H. L. Wells, and 'The Chemist and the Community,' by A. D. Little.

In the discussion which followed the second address reference was made to the establishment of the Perkin Chemical

Library, an account of which has already been given in these pages.

At the afternoon session C. F. Mabery, the retiring chairman of Section C, delivered an address on 'The Education of the Professional Chemist.' On Friday morning four of the sections of the Chemical Society held their meetings, at which the following papers were read:

INORGANIC CHEMISTRY

H. L. Wells, Chairman

The Solubility of Lime in Solutions of Nitric Acid: F. K. Cameron and W. O. Robinson.

The complete solubility curves at 25° were given for that part of the system in which the solutions have an alkaline reaction. It was found that there was a curve for solutions in contact with calcium hydroxide as solid phase; a curve for solutions in contact with a series of solid solutions containing lime and nitric acid as solid phase; a curve for solutions where the solid phase had the composition $CaO.N_2O_5.3\frac{1}{2}H_2O$, and a curve when $Ca(NO_3)_2.4H_2O$ was the solid phase. The basic nitrate appeared to be identical with one formerly noted by Werner. It is efflorescent, loses water and breaks down on exposure to the air or more rapidly by washing with alcohol.

The Behavior of Nickel Sulphide toward Hydrochloric Acid and the Qualitative Separation of Nickel and Cobalt from Manganese and Zinc: H. C. Cooper.

Beryllium Nitrate: Charles L. Parsons.

Normal beryllium nitrate, although an article of commerce, has no place in literature. It can only be made by evaporating a solution of beryllium hydroxide or basic carbonate in nitric acid to a thick, gummy and basic mass and dissolving same in a moderate excess of concentrated nitric acid from which it crystallizes as $Be(NO_3)_2\cdot 4H_2O$ on cooling. The salt loses its nitric anhydride component easily. It melts in its own water of crystallization at 60.5°. It is soluble in alcohol and acetone.

The Instability of Certain Tungstates: R. C. Wells.

By means of the electrical conductivity of their solutions it is possible to follow the transformations which para- and octatungstates undergo in water. The latter salts have the formula $M_6W_8O_{27}$ with more or less water of crystallization. The transformations take place more quickly at high temperatures, requiring only about twenty-five minutes to proceed half way at 80°. Not enough data are yet at hand to settle definitely the nature of the change.

Pentavalent Bismuth: Victor Lenher and E. B. Hutchins, Jr.

In making a study of the higher valences of bismuth, it has been found that the tetroxide is fairly stable and that potassium bismuthate and bismuthic acid doubtless exist in a fair degree of purity. In studying the halogen derivatives, the pentoxide on treatment with hydrochloric acid at low temperatures, the treatment of the trichloride with chlorine in a Dewar bulk at liquid-air temperatures and the treatment of the trihalides with various perhalides of cesium yielded only derivatives of the trivalent type.

The Action of Thionyl and Sulphuryl Chlorides on Selenium and Selenium Dioxide: Victor Lenher and H. B. North.

By the interaction of selenium dioxide and thionyl chloride, by the treatment of elementary selenium with thionyl chloride and by the action of sulphuryl chloride on elementary selenium, the tetrachloride of selenium is obtained. On the other hand, selenium dioxide can be sublimed in the vapor of sulphuryl chloride without any reaction taking place.

The Atomic Weight of Hydrogen: WM. A. NOYES.

This work, now in progress at the Bureau of Standards, is in part a repetition of the method used by the author some years ago, when he obtained for the ratio H:O, the values, 15.896 (H = 1) or 1.00654 (O = 16). When corrected for the gases occluded in the copper oxide used as the source of the oxygen, these values become 15.878 or 1.00765. In the recent work the oxygen is weighed as copper oxide, the increase in weight when the hydrogen is passed into the tube is also determined and, besides, the water is weighed separately. In other determinations the hydrogen is first weighed absorbed in palladium, and its weight checked by the increase in weight of the copper oxide tube, as well as by the weight of the water alone. The mean of a number of determinations gives a value which is somewhat higher than Morley's on the oxygen basis. Other experiments are in progress in which no copper oxide is used, the oxygen being passed directly into a tube containing palladium saturated with hydrogen. In this way as much as thirty-five to forty grams of water can be formed in a single determination, thus lowering the probable error.

The Selection of the Most Probable Value for the Atomic Weight of an Element: WM. A. NOYES.

A discussion of the principles which should govern the selection of the atomic weight of an element when a number of workers have determined it in different ways or by the same method. The later determinations should usually have greater weight than the older ones, and in many cases the latter should no longer be used in calculating the mean, especially when sources of error overlooked by the earlier investigators have been avoided in the later work.

The Separation of Calcium and Magnesium: NICHOLAS KNIGHT. (By title.)

Combinations of the Sesquioxides with the Acid Molybdates: R. D. HALL.

A study was made of the compounds containing the various sesquioxides in combination with the acid molybdates with a view of determining whether they were double molybdates or whether they were derivatives of a complex inorganic acid.

The methods employed were: (1) Preparation of other salts by double decomposition, (2) preparation of the free acid, (3) dialysis of the alkali salts. All favored the considering of these salts as derivations of a complex inorganic acid. The following nickel and cobalt derivations were obtained:

$$3K_2O \cdot NiO_2 \cdot 9MoO_3 \quad \text{and} \quad 3K_2O \cdot CoO_2 \cdot 9MoO_3,$$

analogous to the complex containing MnO_2 in union with MoO_3.

The Direct Quantitative Analysis of Mixtures of Bromides with Chlorides: LAUNCELOT W. ANDREWS.

On the Density Curve of Mixtures of Bromine and Chlorine: LAUNCELOT W. ANDREWS.

The Homogeneity of Tellurium: VICTOR LENHER.

In studying the action of tellurium and tellurium dioxide toward various reagents such as sulphur monochloride, phosphorus oxychloride, antimony pentachloride, etc., in addition to the formation of tellurium tetrachloride or double chlorides, mother liquors were obtained which were carefully tested for tellurium and found by experiment to contain tellurium with an atomic weight of 127.5. Fractional precipitation by means of ferrous salts from the chloride solution gave the figure 127.55. By the slow solution of tellurium in hydrochloric acid, in presence of air, a fraction was obtained, which gave 127.5 as the atomic weight of tellurium. Three series of atomic weight determinations of tellurium from Bohemia, Cripple Creek and from western copper ores were made. The double bromide of tellurium and potassium was heated in chlorine gas and the potassium chloride weighed. All of the tellurium from these various sources showed an atomic weight of 127.5 and no evidence of lack of homogeneity of tellurium has ever appeared to the author.

An Improved Method for the Qualitative Analysis of the Tin Group, including the Detection of some of the Rarer Elements: Arthur A. Noyes and Wm. C. Bray.

ORGANIC CHEMISTRY

A. S. Wheeler, Chairman

The Nitration of N-Substituted Anilines: J. Bishop Tingle and F. C. Blanck.

A continuation of the work already reported (*Amer. Chem. Jour.*, **36**, 305). The additional results obtained appear to warrant the statement of the following provisional rule: *In the nitration of N-substituted aniline derivatives, by means of a mixture of nitric and some other acid, the position of the first entering nitro group depends on two influences, viz., the nature of this N-substituting group and the strength of the acid, other than nitric, which is present, and these two factors may be so selected as to neutralize or reinforce each other.*

The Nitration of Benzene: J. Bishop Tingle and F. C. Blanck.

An investigation of the formation of dinitrobenzene in the presence of sulphuric acid and also of non-acidic or feebly acidic dehydrating agents. The results indicate that the formation of the dinitro derivative is preceded by that of mononitrobenzene. The use of sulphuric acid appears to give a larger yield of crude nitration products containing a lower percentage of *meta* compound and about the same percentage of mixed isomers soluble in alcohol. As nitric acid is a stronger acid than sulphuric, the result accords with the 'rule' deduced from the nitration experiments with N-substituted anilines and indicates that the rule is of general application.

Acyl Derivatives of Ortho- and Paraminophenols: J. Bishop Tingle and L. F. Williams.

An easy method is described for the preparation of ortho- and paraminophenol by which good yields are obtained. Many new acyl derivatives of these compounds are described. The results of the work may be summarized by saying that, of the thirty derivatives of this type now known, thirteen have been obtained for the first time by the authors, three have been prepared by newer and simpler methods, the melting point of one other has been corrected and the existence of two of the remainder has been shown to be extremely doubtful.

Condensation of 1, 3-Diketones with Secondary Amines: J. Bishop Tingle and L. F. Williams.

A number of condensation compounds of camphoroxalic acid and secondary amines have been prepared. Their existence tells strongly in favor of the enolic formula for camphoroxalic acid. The amines employed were acetylphenylhydrazine, dibenzylamine, diamylamine and diisoamylamine; similar products from dimethylamine and diethylamine have been previously obtained by the senior author, and, as a class, the substances are believed to be new. Condensation compounds, belonging to various types, of the above acid with the following primary amines have also been obtained: ethylamine, orthoaminophenol and paranitraniline. Camphoroxalic acid and triethylamine yield a salt.

The Relative Value of Calcium, Sodium, Sodamide and Sodium Ethylate in Promoting the Claisen Reaction: J. BISHOP TINGLE and ERNEST E. GORSLINE.

The experiments were carried out with camphor and various esters employing the condensing agents mentioned above. The effects of temperature, solvent and of certain other factors were studied. The best agent is sodium wire; calcium and sodamide are about equal in condensing power, but are decidedly inferior to sodium; sodium ethylate is the least active condensing material. The effect of the solvent is very marked, it is independent of the temperature and the question is raised as to the possibility of its playing a definite chemical part in the condensation, similar, perhaps, to its rôle in the formation of the Grignard reagent.

Preparation of Aniline Derivatives of Succinic and Phthalic Acids: J. BISHOP TINGLE and MARSHALL P. CRAM.

The current methods for the preparation of succinanil and of succinanilic acid have been somewhat modified. Succinanilide has been prepared by a new and simple method. A modified process for the preparation of phthalanil is described and also some experiments regarding the preparation and relative stability of phthalanilic acid and of phthalanilide.

Hydrazones of Aromatic Hydroxyketones; Alkali-Insoluble Phenols: HENRY A. TORREY and H. B. KIPPER.

It was found that many aromatic hydroxyketones, such as, pæonol, resodiacetophenone, dibenzohydroquinol and dibenzoresorcinol gave stable phenylhydrazones. These hydrazones, though from their method of preparation they would appear to have one or more free hydroxyl groups, are, nevertheless, insoluble in aqueous alkalies. It is possible that the insolubility of these compounds may be due to their having a quinoid structure, and that no hydroxyl group is actually present.

Quinazolinecarboxylic Acids: M. T. BOGERT, J. D. WIGGIN and J. E. SINCLAIR.

The authors converted 3-amino-1,4-xylene and 4-amino-1,3-xylene, into their acetyl derivatives, oxidized the latter to the corresponding phthalic acids, changed these aminophthalic acids into their acetanthranils, and prepared quinazolinecarboxylic acids from the latter by condensation with various primary amines.

Isomeric Oxygen and Nitrogen Ethers in the Quinazoline Group: M. T. BOGERT and H. A. SEIL.

The authors prepared various quinazoline ethers of the type -OR and -NR by alkylation of the hydroxyquinazolines and by other methods. They find that methyl iodide invariably gives the -NR compound, while ethyl iodide generally yields the oxygen ether.

4-Aminophthalic Acid and Some of its Derivatives: M. T. BOGERT and R. R. RENSHAW.

A description of the methods of preparation and properties of 4-aminophthalic acid and the following derivatives: the hydrochloride, a number of metallic salts, the anhydride, imide, monomethylaminoimide, the 4-monoamide of trimellitic acid, the dimethyl succinimido- and dimethyl phthalimidophthalate, and the 3,4-dimethyl ester of diphthalylurea.

Synthesis of 7-Nitroquinazolines from 4-Nitroorthotoluidine: M. T. BOGERT and W. KLABER.

4-nitroacetanthranil was condensed with various primary amines, both aromatic and aliphatic, thus producing the 7-nitro-2-methyl-4-ketodihydroquinazoline derivatives. The amines employed included amino-esters, nitriles and diamines.

The Synthesis of Naphthotetrazines from p-Diaminoterephthalic Acid and Related Compounds: M. T. BOGERT and J. M. NELSON.

The diphenyluraminodiacetyl derivatives of *p*-diaminoterephthalic diethyl ester, and the corresponding diacetdianthranil were prepared. These were condensed with ammonia, and some of the aromatic and aliphatic primary amines, and the corresponding naphthotetrazines obtained.

Diphenylbrommethylamine: F. J. MOORE.

The Basic Properties of Carbon: J. F. NORRIS.

The fact was brought out that certain derivatives of methyl alcohol show the properties of weak bases. Triphenylcarbinol is converted by concentrated aqueous solutions of hydrochloric, hydrobromic, and hydriodic acids into the corresponding salts. Tertiary butyl alcohol also shows this property. Tritolycarbinol is changed into tritolymethyl chloride by dilute hydrochloric acid, and readily forms a nitrate with nitric acid. The ethers of these carbinols are converted into the chlorides of the substituted methyl radicals by aqueous hydrochloric acid, and the ethers can be formed by the action of a few drops of dilute hydrochloric acid on an alcoholic solution of the carbinols.

INDUSTRIAL CHEMISTRY

A. D. Little, Chairman

When is Time of More Value than Refinement of Method? Mrs. ELLEN H. RICHARDS.

The purpose of the investigation was to ascertain the practicability of shortening and intensifying quantitative methods of investigation in sanitary and industrial chemistry so that they could be intelligently used by high school pupils. The results were promising enough to be extended by other laboratory workers, and the purpose of the paper was to urge more attention to ways of interesting the public in order that research may be more fully supported by non-scientific business men and state and city officials.

A Rapid Method for the Determination of Calcium in Water and its Significance in Connection with the Analysis of Water for Boiler Purposes: F. E. HALE.

Air Elutriation of Fine Powders: ALLERTON S. CUSHMAN.

In order to study the influences of fineness of the particles on the rate of decomposition of rock powders when acted on by water, it has been necessary to devise an air separator for use in the laboratory. By means of a simple apparatus in which both blast and vacuum are employed, it has been possible to easily separate powders that have passed the finest meshed sieves obtainable into four or five graded sizes. A 200-mesh rock powder invariably contains a certain proportion of particles that may be called ultimately fine, having reached the mechanical limits of possible subdivision. If these smallest particles can be separated interesting investigations can be made on the influence of the maximum surface area for unit weight, when the powders are acted on by water.

The Relation between the Ultimate Composition and the Physical Properties of Portland Cement: RICHARD K. MEADE.

The Available Hydrogen of Coal: S. W. PARR.

The fundamental proposition is based on the idea that the original substance from which coal has resulted was made up of substantially the same sort of material and the 'products of decomposition represent a progression which at any given stage in any case bear a constant likeness of composition at the same stage in another case.' By selecting, therefore, a proper unit of comparison a curve may be developed which shall show at any point of reference the amount of available hydrogen present. Tabulations of results from 180 coals widely distributed throughout the United States show an average as to accuracy approximately one third better than the results as derived from ultimate analysis.

The Testing of Copper and its By-products in American Refineries: GEORGE L. HEATH.

A proper analytical control of refining is attained by the determination of the quality of all supplies and fluxes, and by mechanical, electrical and chemical tests of the metal itself. The growing severity of commercial requirements in regard to the purity and electrical conductivity of a metal, whose properties are sensibly affected by less than 0.002 per cent. of some foreign elements, makes the knowledge and control of its impurities a problem of the highest importance for the present and future, to both producer and consumer.

A condensed account was given of the latest methods of analysis, and assaying in use at large smelting and custom laboratories, giving preference to those considered most accurate.

A determination may be required of one, or all, of the following elements; copper, gold, silver, oxygen, sulphur, selenium, tellurium, arsenic, antimony, tin, lead, iron, zinc, cobalt, nickel and manganese, and appropriate methods of analysis are indicated, in the original paper, for each natural group of foreign constituents. A short discussion is also given of the technical determination of the electrical resistance of copper, mentioning some causes of lack of agreement in commercial tests.

The Osage Orange: a Dye Wood: A. S. WHEELER and STROUD JORDAN.

The bright yellow coloring matter is extracted with alcohol, giving a beautiful green-red fluorescent solution. Textile fabrics are readily dyed. The dye is not a good indicator. Its constitution is under investigation.

The Determination of Arsenic and other Solid Constituents of Smelter Smoke, with a Study of the Effects of High Stacks and Large Condensing Flues: WM. D. HARKINS.

The amounts of materials of industrial value given out in the smoke are often enormous. The analysis of the smoke of one smelter shows an approximate daily output in the smoke of fifty-five thousand pounds of arsenic trioxide, three to four million pounds of sulphur dioxide, three hundred thousand pounds of sulphur trioxide, six thousand pounds of zinc, five thousand of copper, six thousand of lead, five thousand of antimony, etc. High stacks throw the smoke to a greater distance from the smelter than low stacks. Captain Taylor's pilot tube is the best instrument for velocity determinations.

Gases vs. Solids: an Investigation of the Injurious Ingredients of Smelter Smoke: W. C. EBAUGH.

The results of experiments upon alfalfa and sugar beet plants with (*a*) gaseous sulphur dioxide, (*b*) aqueous solutions of sulphur dioxide, and (*c*) 'flue dust' or fume in various forms, show that heretofore the amount of injury done by sulphur dioxide has been unduly emphasized, and that that due to the solid emanations of the smelters has been ignored. The effects of the investigations will be to modify the means adopted by smelting plants to eliminate the dangerous substances from their smoke.

Experiments on the Manufacture of Chlorates and Hypochlorites with a View to High Current Efficiency: A. G. BETTS and R. H. SHERRY.

A series of experiments was made using

different cathodes and also with the addition of various substances to the solutions: It was found that magnesium used as cathode gave a high current efficiency. Comparative results gave the current efficiency in a solution of potassium chloride to which sodium chromate had been added as 69.3 per cent., and in a potassium chloride solution with a magnesium cathode as 65 per cent. On a continuous run the efficiency of this cathode in making chlorate was 90 per cent. the first hour and 60 per cent. from the fourth through the eighth hour. In making hypochlorite with a 12.5 per cent. salt solution the efficiency was 96 per cent. for the first hour and 75 per cent. for the ninth hour. The loss of magnesium was very small. It was found that from one third to one half the salt could be converted and a current yield of from 60 per cent. to 70 per cent. could be obtained. In addition to this advantage, the power cost is low. The hypochlorite solution is quite clear and ready for use after dilution.

A Plea for the Systematic Study of American Gas Coals: H. B. Harrop.

Standard fields like the 'Pittsburg' are now working down to poor grades, while many areas now believed to be unsuitable may yet be proved satisfactory. Knowledge of location, extent and character of various coal deposits capable of supplying gas works and by-product oven plants is very meager both among gas engineers and commercial chemical engineers. Qualities of coal required for gas works and ovens discussed: gas yield, character of gas, impurities, quality of coke, tendency of ash to 'clinker,' and suitable carbonizing treatment. The author discusses, in the light of his own experiments, the merits and failings of the crucible volatile matter test and the practicability of a standard apparatus for determining the best carbonizing temperature, gas yield and character of gas. A committee is recommended to cooperate with the Coal Mapping Subcommittee of the American Gas Institute.

Viscosity and Lubrication: Chas. F. Mabery and J. H. Mathews.

This paper presented results on the chemical composition, viscosity and durability tests of lubricating oils, manufactured from different petroleums, and the composition and viscosity of the principal constituents of commercial lubricating oils. The hydrocarbons examined and separated from the crude petroleum from different fields, as well as from the lubricating oils themselves, were of the series of hydrocarbons, C_nH_{2n+2}, C_nH_{2n}, C_nH_{2n-2}, C_nH_{2n-4}. The viscosity of these series varies regularly from the series C_nH_{2n+2}, which is very low, to the series C_nH_{2n-4}, which has a very high viscosity corresponding to the high viscosity of lubricating oils made from the heavy petroleum that is composed largely of the series, C_nH_{2n}, C_nH_{2n-2}, C_nH_{2n-4}. The durability tests corresponded to the variation in viscosity. Viscosity was determined in the apparatus of Ostwald, and calculated from his formula

$$n = n_0(td/t_0d_0).$$

Viscosity of these products was also determined by the Saybolt universal viscosimeter. The durability tests were made on a bearing under 500 revolutions carrying a load of 500 pounds, with a regular addition of the oil at the rate of six drops per minute, during the first two hours. During the tests readings of temperature were taken at intervals of five minutes and the friction was also determined from readings of weights on a balance taken at the same intervals. The coefficient of friction was calculated from the formula $F = WL/R$ where $W =$ dif. in wt. lbs.; $L =$ length of lever; $R =$ radius of axle. A comparison of various lubricating oils showed that viscosity alone can not be relied on as an accurate means for determining their commercial value in lubrication. This work is being extended, including the question as to the comparative value of straight hydrocarbon oils and compounded oils and any harmful effects of the latter due to corrosion.

Suspensions in Dilute Alkaline Solutions: W. R. WHITNEY and ALONZO STRAW.

The Annealing of Sterling Silver: W. H. WALKER.

The sterling silver of commerce is an alloy of 92.5 per cent. silver and 7.5 per cent. copper. The frequent annealing incident to the manufacture of silver-ware produces, when the article is polished, a black reflex or sheen called by the workmen 'fire surface.' This can be removed only by dissolving in nitric acid that portion of the ware affected. A study of this matter shows that, notwithstanding the literature on the subject to the contrary, the difficulty is caused by the formation of copper oxide in the alloy, and that it may be prevented by annealing under such conditions as will practically eliminate oxygen. A method based on the above observations is now in practical use in a number of establishments.

Fullers' Earth and its Application to the Bleaching of Oils: C. L. PARSONS.

A paper on the American occurrence, the properties and absorptive qualities of fullers' earth.

The Modern Canning Industry: Mr. MORRIS.

Denatured Alcohol and the New Law: C. E. MUNROE.

Rosin Size of High Free-Rosin Content: EDWARD F. MOODY.

Discussed the rosin sizing of paper, with particular reference to mill-made sizes, composed of completely saponified rosin, as compared with the more recent developments in high free-rosin sizes. The sizing effects of the former were shown to be due to the precipitated aluminum resinate, which, being somewhat soluble in water, is not a perfect water-proofing agent in paper; whereas, in the latter case, the insoluble rosin itself is the sizing agent, producing the desired results more economically. Also the causes of froth, imperfect sizing and other matters of interest to the paper industry were discussed.

Agricultural and Sanitary Chemistry—L. L. Van Slyke, chairman.

Food Adulterations: C. B. COCHRAN. (By title.)

India Beeswax: J. F. GEISLER.

The Efficiency of Certain Phosphates as Influenced by Liming and by the Variety of the Plant: H. J. WHEELER and G. E. ADAMS.

Field experiments with nine different phosphates have been in progress at the Rhode Island Agricultural Experiment Station since 1894.

In one series lime has been applied in small quantities and in the other it has been omitted. Many different varieties of plants have been employed. The results show marked benefit from liming in connection with superphosphates, and in a less degree with floats, bone meal, and basic slag meal. The soil is naturally practically devoid of carbonate of lime and when moistened, quickly and intensely reddens blue litmus paper. No doubt liming in excess would have the opposite effect on superphosphates. The cabbage and some other crops were practically a total failure where floats were used, yet certain other varieties of plants made much better use of them.

The most remarkable feature was the wonderful effect of liming in increasing the efficiency of the roasted Redondite (iron and aluminum phosphate). This material contains a total of 45 to 50 per cent. phosphorus pentoxid, of which 38 to 40 per cent. is 'reverted'; also 2.5 to 3.5 per cent. ferric oxid and 45 to 50 per cent. aluminum oxid. Liming was of no benefit and acted injuriously in connection with the finely ground unroasted material. The efficiency of the phosphates is influenced by the soil, the other manures, and by the variety of plant in a most marked degree, hence the danger of drawing conclusions from insufficient data is great.

The Functions and Agricultural Value of Certain Sodium Salts: H. J. WHEELER, B. L. HARTWELL and F. R. PEMBER.

The investigation of this question has been in progress at the Rhode Island Agricultural Experiment Station since 1894.

Plants have been grown in the field during twelve years by the use of sodium carbonate and sodium chloride, by the corresponding potassium salts and by various mixtures of the sodium and potassium salts. Evidence was afforded of a liberation of potassium from the soil by the sodium salts. When the supply of potassium was limited sodium salts greatly increased the yields of the mangel wurzel, turnip, radish and certain other root crops; at the same time the percentage of phosphorus in the dry matter was usually increased. This increase was greater in the case of the carbonates than with the chlorids, however it seemed to be an incidental accompaniment of, rather than the cause of, the increased yield. Sodium did not appear to have been of special benefit because of its serving as a better carrier of nitrogen to the plant than potassium, neither was the benefit explainable by virtue of liberating lime or magnesia nor on account of changes in the relation of the two, removed by the plant.

Sand culture and water culture were both resorted to in order to eliminate factors arising in the field. The results thus far secured by water culture show benefit from sodium in the presence of small supplies of potassium, which is not obtained in the same degree when a like osmotic pressure is provided by the employment of salts of calcium. Sodium seems to enable a small supply of potassium to produce a larger crop by virtue of performing some part of the functions which potassium may perform if present in sufficient quantities. Sodium used in connection with potassium sometimes prevents plants from taking so great an excess of potassium from the soil as they would otherwise remove.

The Action of Acids on Casein when no Solution takes Place: L. L. VAN SLYKE and D. D. VAN SLYKE.

When casein is suspended in a solution of acid, the casein takes acid from the solution, the casein remaining solid under proper conditions of dilution of acid, temperature, etc. The amount of acid thus taken up by casein varies with the concentration of the acid, the temperature, the time of contact and the kind of acid. The phenomena do not indicate simple chemical combination of acid and casein, but correspond closely to the conditions described by van Bemmeln as applying to what he calls absorption compounds.

The Accuracy of Phenolphthalein as an Indicator in Determining the Acidity of Casein: L. L. VAN SLYKE and D. D. VAN SLYKE.

In determining the acidity of casein by titration with alkali, different indicators give different results. With phenolphthalein higher results are given than with litmus or methyl orange. The results with phenolphthalein have been chosen arbitrarily as being most accurate. Measurement of the conductivity of the solution was used. When a given amount of alkali solution is neutralized by addition of casein, the solution decreases in conductivity until the neutral point is reached, after which further additions of casein do not change the conductivity. The results thus obtained agree quite closely with those given by phenolphthalein.

The Sanitary Analysis of Water: L. P. KINNICUTT.

The Organic Components of the Soil in their Relation to some Properties of Roots: OSWALD SCHREINER and HOWARD S. REED.

The authors pointed out the toxic properties of soil extracts from unproductive soils and the effect of absorbing agents, organic substances and simple treatments, such as dilution with water, boiling, etc., in improving the conditions for plant growth. The oxidizing power of plant roots in connection with these toxic conditions, and the effect of fertilizers on these oxidizing properties were emphasized, as was also the production of toxic conditions by previous root growth.

Comparative Intensities of Colors used in Confectionery: EDWARD GUDEMAN.

Method of obtaining strength of colors without comparison with standard color, based on height of column through which diffused light will pass. Description of apparatus. Details and results withheld on account of other investigations on colors now being made.

The Changes in the Fat of Bread during Baking, and Methods for its Determination: J. S. CHAMBERLAIN.

The Unification of Reducing Sugar Methods: PERCY H. WALKER.

The Ripening of Strawberries, Raspberries, Blackberries, Gooseberries and Currants: W. D. BIGELOW and H. C. GORE.

The Preparation and Composition of Vinegar from Kieffer Pears: H. C. GORE.

The Preparation of Unfermented Apple Juice: H. C. GORE.

Absorption by Soils: F. K. CAMERON and H. E. PATTEN.

Various types of distribution curves and velocity equations were considered, and illustrated by examples from the literature and the authors' own experiments with dyestuffs, fertilizer salts and liquid manures. The causes for variations which soils present, from the ideal types, were pointed out, and the magnitude of absorption effects was shown to be much greater than is usually supposed.

A Comparison of Methods for the Determination of the Alkalinity of Ash: HERMANN C. LYTHGOE.

Varying results on alkalinity of ash are reported by different chemists owing to the use of different indicators. The results reported in the following table were obtained on one sample each of vinegar, lime juice and raspberry syrup. The difference in the results is due to the presence of phosphates.

ALKALINITY OF ASH. C.C. OF N/10 ACID REQUIRED TO NEUTRALIZE THE ASH OF 100 GRAMS OF SAMPLE.

Character of Sample	Indicator			
	Phenolphthalein	Methyl Orange	Cochineal	Litmus
Vinegar	33.1	40.9	37.9	24.9
Lime juice	15.8	18.8	17.5	12.2
Raspberry syrup	15.5	20.3	17.1	11.0

The Possible Use of Corn Oil as an Adulterant of Lard and its Detection: WM. MCPHERSON and WARREN A. RUTH. (By title.)

The Influence of Climate on the Composition of Wheat: J. A. LECLERC.

The Work of the Association of Official Agricultural Chemists on the Analysis of Tanning Materials: F. P. Veitch.

Soil Acidity in its Relation to Lack of Available Phosphates: A. R. Whitson and C. W. Stoddart.

Experience has shown that a direct determination of the amount of essential elements present in a soil does not show its fertility, since it does not consider the degree of availability. It is unquestionably true, however, that the processes by which these elements become available are chemical, and depend upon the conditions existing in the soil. A determination of the conditions which influence the rate at which the elements become available and which affect the accumulation of the available material would enable us to diagnose the needs of the soil more quickly and surely than by direct field and pot experiments. Investigations of the fertilizer requirements of soils during the past two or three years have shown that whenever a soil is acid it needs phosphates.

Careful tests were made on nineteen soils, thirteen of them acid. All acid soils showed by field or plant-house tests the need of a phosphate fertilizer. Three of the soils, not acid, showed the need of phosphates, although rather slight in one case. The soils tested were mostly clays from as many different localities in Wisconsin as possible.

Although there is phosphoric acid present in these soils in sufficient quantity for many crops it is unavailable, and hence the soils need phosphate fertilizers. The soil acids probably act upon the readily available phosphates, such as the calcium phosphates, at a more rapid rate than the normal, neutral or alkaline soil moisture, and when once in solution these phosphates are readily washed out by heavy rains, or are fixed by iron and aluminium hydroxides—that is, are precipitated and rendered unavailable as insoluble iron and aluminium phosphates. When there is sufficient lime in the soil to maintain the phosphoric acid in the form of calcium phosphates, the plant is able to obtain enough phosphorus for its use, since calcium phosphate is soluble enough to supply the needs of a growing crop.

A Quick Method for the Determination of Moisture in Grain: E. Brown and J. W. T. Duvel.

By the use of the method and the apparatus outlined in this paper, the moisture content of any sample of grain or similar material, can be determined in from twenty to thirty minutes. The method consists primarily in heating the weighed sample of grain in about 100 c.c. of hydrocarbon oil, the moisture expelled being afterwards condensed and measured in a graduated flask reading to tenths per cent. A special apparatus is required for this method of making moisture determinations.

In the afternoon a number of the chemists were given a luncheon at the works of the Schultz Mineral Water Company, after which there was a choice of excursions to the Gas Works, the Pacific Borax Works and the New Jersey Zinc Works at Newark. The same evening there was a subscription dinner at the Waldorf Hotel.

On Saturday morning the annual meeting of the American Chemical Society was held. The secretary reported that the membership was now 3,079, a net gain of 160 over last year. There are, besides, 187 members who have been elected, but who have not yet qualified. Of the latter, 150 had applied during the last two months. New local sections have been established in Minnesota, Indiana, Louisiana and at the University of Illinois.

The report of the treasurer showed that

the finances of the society are in a satisfactory condition.

The report of the librarian was also read.

The editor reported that during 1906, 217 papers had been submitted for publication, of which 160 had been accepted without change, 25 after revision and 32 were not suitable for the *Chemical Journal.* Of these last, many were considered as better adapted for journals of a more general nature, and were rejected by the committee on publications solely for this reason. The editor also gave an account of the progress which had been made on the new journal, *Chemical Abstracts.* It is planned to make it fully as complete as the *Zentralblatt,* and two numbers will be issued each month. He urged that every member of the society try to encourage other chemists to join. To meet the cost of the new publication the dues have been raised to eight dollars, but it will not be possible to continue the publication if any considerable number of the members drop out on this account. In this connection he stated that the gratifying increase in membership during the last few months of the year was largely due to the new journal.

With a view to increasing the usefulness of *Chemical Abstracts* the council appointed a committee to consider the relationship of the society to other chemical organizations and to other chemical publications. It was also decided to add to the council two new members, both of whom were to be technical chemists.

The officers of the society for 1907 are:

President—M. T. Bogert.
Vice-Presidents—The presidents of the local sections.
Secretary and Editor—Wm. A. Noyes.
Treasurer—A. P. Hallock.
Librarian—E. G. Love.

J. H. Long, chairman of the committee on the quality of reagents, reported that the committee was in process of reorganization.

W. F. Hillebrand, chairman of the committee on uniformity of technical analysis, reported that there had been organized subcommittees on zinc ores, rosin and shellac and phosphate rock.

L. P. Kinnicutt, chairman, stated that the committee on water analysis had been reviewing and testing various methods of analysis.

J. H. Long, chairman of the committee on untaxed alcohol, requested that the committee be disbanded, as a satisfactory law had been passed by Congress.

The meeting of the Chemical Society was followed by a meeting of Section C, at which the following report and addresses were given:

G. C. Stone and W. George Waring: Report of the committee on the analysis of zinc ores. Gave the tabulated results of three series of analyses of zinc ores and said that a fourth sample would soon be sent out.

Cellulose: A. S. WHEELER.

Agricultural Chemistry in Relation to Research: L. L. VAN SLYKE.

At noon the meeting adjourned to the College of the City of New York, where two lectures were given:

The Electrical Industries at Niagara Falls: C. F. CHANDLER.

The Geology of Niagara Falls: JOHN M. CLARK.

After the addresses the chemists were entertained at luncheon in the gymnasium of the college. After this visits were paid to a brewery in the neighborhood, the Interborough Power Station and the American Museum of Natural History.

In the evening the retiring president, W. F. Hillebrand, delivered an address on 'The Present and Future of the American

Chemical Society.' This has been published in SCIENCE and in the *Journal* of the society. After the address the visiting members were given a complimentary smoker by the members of the club.

On Monday other meetings of sections were held.

PHYSICAL CHEMISTRY

Alexander Smith, Chairman

The Electrolytic Purification of Cerium: J. P. MAGNUSSON.

The Conductivity and Ionization of Salts in Aqueous Solution at High Temperatures: A. A. NOYES, W. D. COOLIDGE, A. C. MELCHER, H. C. COOPER and G. W. EASTMAN.

The Hydrolysis of Salts and the Ionization of Water from 0° to 306°: A. A. NOYES, Y. KATO, R. B. SOSMAN and C. W. KANOLT.

Photochemistry and the Phase Rule: WILDER D. BANCROFT.

Thermochemistry: JOSEPH W. RICHARDS.

Discussed the mechanism of endothermic reactions, taking as types of three common reactions the reduction of zinc oxide by carbon, the production of water gas by steam acting on carbon, and the reduction of iron oxides by carbon monoxide in the blast furnace. The analogy of these reactions to simple physical changes absorbing heat, was particularly dwelt upon.

The Final Disintegration Products of Uranium: B. B. BOLTWOOD.

The conclusion is reached that in unaltered, primary minerals from the same locality the amount of lead is proportional to the amount of uranium, and that in unaltered, primary minerals from different localities the amount of lead relative to uranium is greatest in minerals from the locality which is geologically the oldest. Hence lead seems to be the final disintegration product of uranium. The amounts of helium found in minerals containing both uranium and thorium are of about the order, and are not in excess of the quantities, to be expected from the assumption that helium is produced by the disintegration of uranium and its products only. From the composition of radioactive minerals it appears highly improbable that either lead or helium is a disintegration product of thorium.

Solution in a Dissolved Solid: CHARLES L. PARSONS.

A study of solutions of iodine in potassium iodide, of lead oxide in solution of lead acetate, of camphor in aqueous acetic acid, of iodine in aqueous acetic acid, etc. It is shown that some solids in solution form a mixed liquid which acts perfectly analogous toward some solutes, to the well-known cases of ternary mixtures where a solid or a liquid is dissolved in two mixed liquids. It was, furthermore, pointed out that many of the physical properties, generally accepted as abnormal, of ternary mixtures are in reality perfectly normal and that in many such cases polymerization is not at all necessary to qualitatively explain the supposed variation from the gas laws.

The Electromotive Force of the Oxyhydrogen Cell: G. N. LEWIS.

Measurements of free energy (the maximum work obtainable from a chemical process) not only are of great importance technically, but they also permit the chemist to predict in what direction and how far chemical reactions will progress. The free energy of many important oxidation processes can be calculated if the potential of the oxygen electrode is known, or the E.M.F. of the oxyhydrogen cell. This was determined in three ways: (1) from the decomposition pressure of silver oxide between 300° and 445°, (2) from measurements of the equilibrium in the Deacon process between 350° and 420°, and (3) from the decomposition pressure of mercuric oxide. These methods give concordant results which show that the E.M.F. of the oxyhydrogen cell is about 1.224 volts, a value which is higher by one tenth of a volt than the one hitherto accepted.

Calculation of Some Chemical Equilibria by the Nernst Formulas: K. G. FALK.

The equilibria for the reactions

$$2SO_2 + O_2 = 2SO_3, \quad H_2 + Cl_2 = 2HCl, \quad H_2 + Br_2 = 2HBr$$

are calculated for different temperatures by means of the formulas developed by Nernst, and which formed the subject of the Silliman lectures (delivered by Nernst) at Yale University in 1906. The calculated values are compared with those found experimentally.

Cadmium Sulphate and Mercurous Sulphate: G. A. HULETT.

The Quantitative Determination of Small Quantities of Arsenic by the Method of Marsh-Liebig as affected by Supertension and Potential Differences: WM. D. HARKINS.

The injurious action of iron and other metals in hindering the reduction of arsenic in the Marsh apparatus, can be prevented by using a temperature of 100° or by the addition of salts of tin, cadmium, lead or bismuth, using the proper conditions. The factors aiding in the reduction when a foreign metal is present or added are: (1) (most important) high superpotential; (2) distance from zinc in the scale of potentials; (3) degree of solubility of the salts formed. Two lengths of hard glass tube should be heated in two fire-brick furnaces to give complete decomposition of the arsine. The method is quantitative.

The Vapor Pressure of Aqueous Nitrate Solutions by the Air-bubbling Method: A. T. LINCOLN. (By title.)

Melting-point Determinations at Low Temperatures: LEO F. GUTTMANN.

A constantan-copper couple connected in series with a sensitive D'Arsonval galvanometer is used, and standardized by determining the known melting points of ice, chloroform, paste of solid carbon dioxide and alcohol, ether and the temperature of liquid air. From the data thus obtained a calibration curve is drawn up. To determine the melting point of a substance, the couple is immersed in the liquid contained in a glass tube, and the liquid frozen. By allowing the substance to warm up slowly, and watching the galvanometer deflections the melting point is ascertained. The melting points determined were those of some of the alkyl alcohols, esters, and iodides, the paraffins, acetaldehyde, ethyl methyl ketone, acetone, ethyl bromide and chloride, toluene, ethylbenzene and the xylenes.

The System Sodium Chloride, Sodium Sulphate, Calcium Sulphate and Water: F. K. CAMERON, J. M. BELL and W. O. ROBINSON.

The invariant points and boundaries for the system sodium chloride, sodium sulphate, calcium sulphate, and water were determined at 25° and the solid diagram constructed. It was shown that fields existed for solutions in contact with the following solid phases: NaCl, $Na_2SO_4 \cdot 10H_2O$, $2Na_2SO_4 \cdot 3CaSO_4$ (glauberite) and $CaSO_4 \cdot H_2O$. No anhydrite field exists.

The Colors of Colloidal Silver: WILDER D. BANCROFT. (By title.)

Studies in Catalysis; Amidine Formation: JULIUS STIEGLITZ.

The formation of amidines according to: $RC(:NH)OR' + NH_3 = RC(:NH)NH_2$

$+ \mathrm{HOR}'$, is accelerated by the addition of an acid (HCl) or of an ammonium salt (NH_4Cl), simply because the reaction substance is not the whole imino ester but only its positive ions. A constant is obtained on the basis of the isothermal equation: $dx/dt = K \times C_{\text{pos. ester ions}} \times C_{NH_3}$, the velocity being always proportionate to the concentration of the positive ester ions, although they form only a very small but rigorously calculable part of the ester used. The results are in entire accord with the author's theory of the catalysis of esters, cane-sugar, etc., under the influence of acids.

Freezing Points of Mixtures of Sulphur and Iodine: ALEXANDER SMITH and C. M. CARSON. (By title.)

This report has been transmitted through Professor Charles L. Parsons, Secretary of Section C.

C. E. WATERS,
Press Secretary.

(*To be continued*)

THE ASSOCIATION OF AMERICAN GEOGRAPHERS

THE third annual meeting of this association was held December 31, 1906, and January 1, 1907, at the building of the American Geographical Society, in New York City. The president, Mr. Cyrus C. Adams, presided, and delivered the president's address upon the subject, 'Some Phases of Future Geographical Work in America.'

Professor I. C. Russell, member and councilor of the association, died during the year, and a memorial was read by Professor W. M. Davis. The Monday evening session was devoted to the following addresses: Mrs. Leonidas Hubbard, Jr., 'The Rapids of Labrador Rivers'; Dr. F. A. Cook, 'The Ascent of Mount McKinley'; Mr. Alfred H. Brooks, 'A Meeting with Captain Amundsen at Nome.'

In the general program the following papers were read by their authors:

William Churchill, 'Insularism, and the Nesiote Type'; A. L. Rotch, 'The Circulation and Temperature of the Atmosphere at Great Heights above the Tropical Atlantic'; Charles C. Adams, 'The Evolution of the Isle Royal Biotic Environment'; G. E. Condra, 'The Opening of the Indian Territory'; I. Bowman, 'The Deserts of Peru and Chili in South American History'; E. N. Transeau, 'The Need of Evaporation Data in Plant Geography'; William Libbey, 'Problems of the Panama Canal'; W J McGee, 'The Prospective Conquest of the Mississippi River'; Angelo Heilprin, 'Guiana and Venezuela as a Field for Geographical Exploration, with some Observations on a Recent Visit to the Essequibo Wilderness'; G. W. Littlehales, 'The Nature and Purpose of the Chart Publications of the Navy Department, and their Geographical Extent'; E. O. Hovey, 'The Isthmus of Tehuantepec'; Alfred H. Brooks, 'Railway Routes in Alaska'; H. L. Bridgeman, 'The International Polar Congress at Brussels'; E. Huntington, 'Influence of Change of Climate upon History'; R. DeC. Ward, 'The Meteorology of the North and South Polar Areas'; W. M. Davis, 'Place of Coastal Plains in Systematic Physiography'; W J McGee, 'The American Deserts and their Reclamation'; W. M. Davis, 'Geography as defined by Hettner'; F. P. Gulliver, 'The Orientation of Maps'; A. P. Brigham, 'Geography for College Entrance'; Collier Cobb, 'Hatteras Island and its Shifting Sands'; D. W. Johnson, 'The Texture of Topography'; W. M. Davis, 'The Eastern Slope of Mexico'; H. E. Merwin, 'Land Forms as Plant Controls'; Cleveland Abbe, 'A Study of Airy's Projection by Balance of Errors'; A. W. Grabau, 'Classification of Marine Life Districts.'

The annual dinner was held on Tuesday