

have been most marked in the southwestern part of the area, not far from the Virunga group of volcanoes of Lake Kivu. Five main blocks may be recognized which are separated by troughs; the islands of the western coast of the Victoria Lake present the first of these, while three others range one behind the other between the lake shore and Valley of the Kagera, and in the intervening troughs lie lakes, swamps or slowly flowing rivers; the fifth forms the Ruanda Plateau west of the Kagera. The edges of these blocks have as yet been but little modified by weathering, so that the latest movements would appear to be comparatively recent.

The formation of Victoria Lake is shown to be due to mutual adjustments among these earth blocks, separated as they are by great faults running in the directions N.-S., E.-W., NE.-SW., and in the area south of the lake also NW.-SE. Again quoting Lyons:

Large masses, many kilometers long, have been raised, lowered or tilted, and in the valleys formed along the fracture lines, the main drainage lines of the district run. Lake Victoria itself is outlined by such fractures.

All writers seem to agree upon the dominance of block movements of the crust in determining the relief of Central East Africa, and it is therefore interesting to learn from these newer studies of the Nile Basin, that the great river itself between Korusko and Aswan (Assouan) wherever crystalline rocks occur in its neighborhood, takes directions parallel to the neighboring intrusive dikes.

While the region is one of earthquakes, the movements disclosed by the series of gauge readings would seem to be of the slower type, and it would be of great interest to know whether the main periods of change of level correspond in time to any subterranean rumblings such as are now being reported from so many unstable districts and are called *brontidi*. As compared with the crustal movements which are revealed by gauge readings within the Laurentian Lake district of North America, these African observations differ in being more rapid, and, further, in indicating reversals in the direction of movement. They similarly, however, point the moral that the sensitiveness of great inland bodies of water,

when employed as precise levelling instruments, has never been properly appreciated.

WM. H. HOBBS

UNIVERSITY OF MICHIGAN,

ANN ARBOR,

January 29, 1910

THE FORTY-FIRST GENERAL MEETING OF  
THE AMERICAN CHEMICAL SOCIETY. II

DIVISION OF FERTILIZER CHEMISTRY

F. B. Carpenter, *Chairman*

J. E. Breckenridge, *Secretary*

*The Direct Estimation of all Intensities of Hydrogen Ion Concentration by Means of Di-nitro-hydrochinone:* LAWRENCE J. HENDERSON.

*The Nitrogen Thermometer from Zinc to Palladium:* A. L. DAY and R. B. SOSMAN.

*Laboratory Methods for Organic Nitrogen Availability:* C. H. JONES.

The alkaline permanganate and pepsin methods for determining organic nitrogen availability as used in the Vermont Experiment Station laboratory are described. Results by these methods on fifty-one high- and low-grade animal and vegetable ammoniates now on the market are tabulated and briefly commented upon.

Both methods have been used at the Vermont Station on officially collected commercial fertilizers for the past twelve years. Tables were shown giving the results of this work.

The writer concludes that the alkaline permanganate method, while empirical, is nevertheless valuable to eliminate quickly from a large number of samples those of questionable availability which may then be tested by the longer pepsin process and qualitatively to show more in detail the nature of the nitrogen source.

The following papers are reported by title:

*Influence of Chemistry on Agriculture:* F. B. CARPENTER. (Chairman's address.)

*Concerning After Effects of Certain Phosphates on Limed and Unlimed Lands:* H. J. WHEELER.  
*New Method for Filtrating Insoluble Phosphoric Acid:* R. H. FASH.

*Facts Brought Out Regarding Uniform Analytical Methods for Phosphate Rock through the Recent Work of the National Fertilizer Association's Committee:* C. F. HAGEDORN.

*Neutralization of the Ammonium Citrate Solution:* J. M. McCANDLESS.

*Note on the Determination of Phosphoric Acid by the Official Volumetric Method:* F. B. CARPENTER.

*The Improvement of Analytical Processes*: W. D. RICHARDSON.

*The Cost of Available Nitrogen in Commercial Fertilizers*: E. B. VOORHEES.

*Bacteriological Methods for Determining the Available Nitrogen in Fertilizers*: J. G. LIPMAN.

*Notes on the Recovery of Waste Platinum*: A. W. BLAIR.

*Method and Materials used in Soil Tests*: H. A. HUSTON.

*Accuracy in Taking and Preparing Mixed Fertilizer Samples*: F. B. PORTER.

*The Determination of Inferior Ammoniates in Commercial Fertilizers*: JOHN P. STREET.

*Reports of Committees*: Paul Rudnick, for the Committee on Nitrogen; G. A. Farnham, for the Committee on Phosphoric Acid; J. E. Breckenridge, for the Committee on Potash; F. B. Veitch, for the Committee on Iron and Aluminum.

#### DIVISION OF AGRICULTURAL AND FOOD CHEMISTRY

W. D. Bigelow, *Chairman*

W. D. B. Penniman, *Secretary*

*Analyses of Maize Products*: EDWARD GUDEMAN.

Analyses of maize products during the last five years, showing changes in composition of these products, especially as to ash, acidity, sulphites, arsenic and metallic impurities. Discussion of the effect of federal and state food acts on the composition of these products.

*The Influence of Microorganisms upon the Quality of Maple Syrup*: H. A. EDSON.

Studies upon the microscopic flora of maple sap during the past three years have shown that the sap within the vascular bundles of the tree is free from microscopic organisms, but that the tap hole, spout and bucket afford favorable lodging places for the development of microscopic life. With the advance of the season as the days become warmer and the freezing nights less frequent and less severe, yeasts, mould spores and bacteria appear in the sap in increasingly great numbers. By isolation and inoculation experiments specific groups of organisms have been shown to be the cause of the various types of abnormal sap characteristic of the late runs, such as green, red, milky and stringy sap. Inoculations with pure cultures in first run material yield syrup of inferior color and flavor such as is frequently produced from the last run.

Sap of the last run when drawn under conditions to exclude heavy inoculations with micro-

organisms yields syrup of superior color and flavor which is in striking contrast to that produced from sap drawn in the usual manner from the same tree at the same time.

*Analyses and Composition of Milk and its Products*: EDWARD GUDEMAN.

Analyses of milks from different localities and at different seasons. Discussion of change of ratio between fat and solids not fat, and influence on composition of concentrated milk products, evaporated and condensed milks and milk powders. Influence of heating milks of various composition during pasteurization, sterilization and concentration.

*The Composition of Milk*: HERMANN C. LYTTHGOE.

Analyses of known purity samples of milk show that the milk sugar is practically constant while the other constituents are variable. This fact may be used in detecting skimming as well as watering. After making the fat and total solids determinations the proteids may be calculated from either by Van Slyke's or Olson's formulæ, respectively. If the milk has been skimmed the calculated proteids will be too low and if the sugar is calculated by difference (assuming an ash content of 0.7 per cent.) it will be too high. Experience has shown that these calculated figures for milk sugar vary between 4.2 per cent. and 4.8 per cent. in pure milk. If the milk has been watered they will be low, while if the samples have been skimmed the calculated sugar will be high.

*Some Applications of Electricity to Apparatus and Laboratories for Water Analysis*: ELLEN H. RICHARDS.

The advantage of using electricity as a source of heat for making distillations, evaporations and running ovens and incubators is pointed out. The tungsten lamp is useful as a uniform source of light for color determinations. Electricity makes possible the use of the ventilating fan and the vacuum cleaner.

It is estimated that electricity is economical for laboratory uses if it can be had at a cost of four cents per kilowatt hour. The cost may be reduced to this figure by any establishment using exhaust steam for heating.

It is so great a saving of labor and adds so much to the general efficiency of the laboratory and accuracy of its results, that it can not be considered dear at twice that cost.

*Pentosans in Soil*: OSWALD SCHREINER and EDMUND C. SHOREY.

Nearly all soils when treated with boiling 12

per cent. hydrochloric acid yield some furfural, indicating the presence of some pentosan body.

Ten soils containing widely different amounts of organic matter (organic carbon from 0.31 to 27.1 per cent.), were subjected to the official method for the determination of pentosans and figures were obtained which varied from 0.005 to 0.275 per cent. No relation between the total carbon and pentosan carbon was apparent, the soil containing 27.1 per cent. organic carbon yielded 0.109 per cent. pentosan, while a soil containing 6.99 per cent. organic carbon yielded 0.275 per cent. pentosan. From this latter soil there was obtained by precipitating a sodium hydrate extract with alcohol a dark-colored, gummy precipitate which yielded a pentose sugar on hydrolysis with acid. An osazone obtained from a solution of this sugar had a melting point of 161° C., and the solution yielded a small amount of the characteristic crystals of the compound of xylose with cadmium.

The following papers are reported by title:

- Relationship between Bacteriological and Chemical Findings in the Examination of Milk, Water and Food Products*: S. C. PRESCOTT.
- Microscopical Examination of Spices and Food Products*: A. L. WINTON.
- The Determination of Cane Sugar by the Use of Invertase*: C. S. HUDSON.
- Sampling of Sugar*: C. A. BROWNE.
- The Composition of Canned Peas and Lima Beans*: W. L. DUBOIS.
- Composition of Cold Water Extracts of Beef*: P. F. TROWBRIDGE and C. R. MOULTON.
- Phosphorus in Flesh*: P. F. TROWBRIDGE.
- The Cold Storage of Apple Cider*: H. C. GORE.
- The Value of Peaches as Vinegar Stock*: H. C. GORE.
- The Composition of Vinegars formed from the Ciders of Different Varieties of Apples*: H. C. GORE and ALICE L. DAVISON.
- The Examination of Vinegar*: R. W. BALCOM.
- The Estimation of Glycerine in Meat Preparations*: F. C. COOK.
- A Comparison of Meat and Yeast Extracts of Known Origin*: F. C. COOK.
- The Working Efficiency of a Constant Temperature Laboratory for Polarizing Sugars*: C. A. BROWNE.
- The Separation of Colloids from Solution by Freezing and some Practical Results*: W. D. RICHARDSON.
- The Use of the Refractometer in Detecting Added Water in Milk*: P. H. SMITH and J. C. REED.
- The Stability of Butter Fat*: E. B. HOLLAND.
- The Influence of the Method of Drying on the Non-volatile Ether Extract of Spices*: A. LEWENSTEIN and W. P. DUNNE.
- Sampling of Ground Spices*: HARRY E. SINDALL.
- Delicacy of the Ferric-chloride and Jorrissen Reaction for Salicylic Acid*: H. C. SHERMAN and A. GROSS.
- The Identification of Mixed Coloring Matters in Foods*: S. P. MULLIKEN.
- Factors which Influence the Digestion of Food*: P. F. TROWBRIDGE.
- Aeration a Factor in the Purification of Water*: W. W. SKINNER and G. W. STILES.
- The Influence of Environment on the Composition of Wheat*: J. A. LECLERC and SHERMAN LEAVITT.
- Rate of Acceleration of Plant Growth with Increase in Temperature*: FRED W. MORSE.
- The Stimulation of Premature Ripening by Chemical Means*: A. E. VINSON.
- The Development of Catalase in Lower Fungi*: ARTHUR W. DOX.
- Wax of Candelilla or Mexican Wax Plant*: G. S. FRAPS.
- Formation of Ammonia Soluble Organic Matter in Soils*: G. S. FRAPS and N. C. HAMMER.
- Nitrates in Pineapple Soils*: A. W. BLAIR.
- Observations bearing upon the Practicability of Certain Chemical Methods of Testing Soils*: H. J. WHEELER.
- The Oxidizing Power of Soils*: M. X. SULLIVAN and F. R. REID.
- Oxidation Effects of Manganese Salts in Soils*: J. J. SKINNER.
- Variation in Methoxyl in Soil Organic Matter*: EDMUND C. SHOREY and ELBERT C. LATHROP.
- Relation of the Active Phosphoric Acid of the Soil to Deficiencies for Phosphoric Acid as shown in Pot Experiments*: G. S. FRAPS.
- Puren Bases in Soils*: OSWALD SCHREINER and EDMUND C. SHOREY.
- The Effect of Certain Plants upon the Nitrate Content of Soils*: T. L. LYON and J. A. BISSELL.
- Chemical Changes produced in Soils by Steam Sterilization*: T. L. LYON and J. A. BISSELL.
- The Detection of Deterioration of Corn and Corn Meal with Special Reference to Pellagra*: C. L. ALSBERG and O. F. BLACK.
- Some New Formulas for the Determination of Dextrose, Dextrine and Maltose*: H. E. BARNARD and W. B. McABEE.
- A Study of the Keeping Qualities of Crushed Fruits, Fruit Syrups and Sugar Syrups*: H. E. BARNARD and I. L. MILLER.

*The Composition of So-called Temperance Beers:*  
H. E. BARNARD.

*The Efficiency of Land Plaster in Preventing the Loss of Ammonia in Manures:* WILFRED W. SCOTT.

#### BIOLOGICAL CHEMISTRY SECTION

In Joint Session with the American Society of  
Biological Chemists

S. C. Prescott, *Chairman*

*The Phosphorus of the Flat Turnip:* BURT L. HARTWELL and WILHELM B. QUANTZ.

It was found that the percentage of phosphorus in the dry matter of flat turnips was influenced by the amount of available phosphorus in the soil upon which the crop was grown. This led to the attempt to ascertain if any particular class of the phosphorus compounds was influenced principally.

About 10 per cent. of the phosphorus of the dry turnip was soluble in 95 per cent. alcohol, and about 70 per cent. was dissolved subsequently in 0.2 hydrochloric acid. Fifty to 70 per cent. of the phosphorus in this extract was precipitable by a molybdenum mixture containing only a small amount of free nitric acid. In fresh turnips about 80 per cent. of the total phosphorus was found in the somewhat colloidal aqueous extract, and over four fifths of this was directly precipitable by magnesium oxid and by the official mixtures of molybdenum and magnesium.

Nearly all of the phosphorus in turnip juice passed through a dialyzer. When added to a standard solution of sodium phosphate, the colloidal matter from within the dialyzer interfered with the complete precipitation of the phosphorus by the molybdc method. Hydrochloric acid added to turnip juice itself to the extent of 0.2 per cent. made it possible, after filtration, to precipitate nearly all of the phosphorus directly from the filtrate. Practically no phosphorus in phytin was present in the juice. It appears as if four fifths of the phosphorus of fresh flat turnips is in soluble compounds and exists mainly as so-called inorganic phosphorus.

*Ratio of Plant Nutrients as affected by Harmful Soil Compounds:* OSWALD SCHREINER and J. J. SKINNER.

Results of a comprehensive study of culture solutions with and without dihydroxystearic acid, a harmful compound isolated from soils, were reported. The culture solutions comprised all possible ratios of the three principal fertilizer

elements: phosphate, nitrate and potassium, varying in 10 per cent. stages. The culture solutions were changed every three days and analyzed, the remaining composition and ratio of the above fertilizer elements being thus determined. In this way the effect of the plant and of the dihydroxystearic acid on the composition and ratio could be determined. The triangular diagram is used in this work and makes possible the intelligent handling and presentation of the results.

Some of the principal results were as follows: The plant growth and absorption were greatest in the solutions containing all three fertilizer elements, but not in equal proportions, the greatest growth and greatest absorption being found in the region below the center in the triangle. The dihydroxystearic acid had the effect of shifting this region of greatest growth toward those ratios higher in nitrogen. Although absorption was greatest in this region, the ratios suffered the least change; the greatest change is produced in those ratios most removed from this normal region.

The harmful soil compound inhibited growth in all the solutions, but was the most harmful in those ratios not well suited for plant growth and least in those best suited for plant growth. Moreover, it is less harmful in the presence of those ratios mainly phosphatic or potassic and this effect is also associated with a higher nitrogen removal. The quantity of phosphate and potash removed was less in the presence of this compound. The investigations tend to throw much light upon the relations between plant growth, absorption, fertilizer action and influence of organic compounds.

*Concurrent Oxidizing and Reducing Power of Roots:* OSWALD SCHREINER and M. X. SULLIVAN.

The roots of growing plants, such as wheat, have the power to oxidize alpha-naphthylamine, benzidine, phenolphthalin, aloin, guaiac, pyrogallol, etc. When indicators like alpha-naphthylamine and benzidine are used, the colors due to oxidation are most intense on the region of the root where growth is most active, the most marked oxidation showing by a distant band of color just back of the root cap. Then comes a practically colorless zone and then a colored zone, the color becoming less intense toward the upper part of the root. Wheat roots grown in sodium selenite neutralized by hydrochloric acid reduce the selenite with a pink deposit of selenium upon the root. This deposit is most marked a short distance back of the root cap just back of the

region of greatest oxidative power, and appears there first. The points of emergence of the secondary roots also show the color strongly. The reducing power is more active in the young and vigorous roots. Roots killed by being dipped in boiling water have no reducing action. Roots in non-neutralized sodium selenite have little, if any, reducing action. In the main, with increased oxidizing power of the wheat root upon aloin, there is an increased reducing power upon neutralized sodium selenite. Potassium iodide in certain concentrations, however, retards oxidation but does not affect the reducing power and may indeed increase it.

*The Cause of Depression produced by Molasses:*  
J. B. LINDSEY.

Experiments were outlined which had been carried on during the past year which showed conclusively that molasses prevents digestion. Many experiments with food molasses added to different sorts of mixtures for cattle, sheep and horses have been tried and it has been found a marked depression was produced by it. The reason for this is not exactly clear although many theories have been advanced to explain it.

*Cornin, the Bitter Principle of Cornus Florida:*  
EMERSON R. MILLER.

The root bark gives best yield. Carpenter considered the bitter principle to be an organic base. The compound separated by Geiger had a slight acid reaction. In pure condition it is perfectly white, has neither basic nor acid properties, is extremely bitter and crystallizes in fine silky needles or beautiful rectangular plates, according to conditions. Melting point  $181^{\circ}\text{C}$ .

Readily soluble in water, sparingly soluble in cold alcohol or cold acetone, but is dissolved to a considerable extent by these liquids at the boiling temperature. Almost insoluble in ether, chloroform, benzole, petroleum ether and acetic ether. Sparingly soluble in benzole or acetic ether at the boiling temperature.

Contrary to Geiger's statement its aqueous solution does not form a precipitate with either silver nitrate or lead subacetate.

Tested for nitrogen with soda-lime or metallic potassium it gave negative results.

An aqueous solution after standing some time assumes color and reduces Fehling's solution. By heating with a little alkali or acid it reduces Fehling's solution at once. It also reduces ammoniacal solution of silver nitrate and bismuth subnitrate in the presence of an alkali, and re-

sponds to Pettenkofer's test for glucose. An aqueous solution does not form a precipitate with phenylhydrazine hydrochloride, but on heating yields a yellowish red precipitate.

The average of ten analyses gave  $\text{C} = 52.49$  per cent.;  $\text{H} = 6.17$  per cent. Computed for the formula  $\text{C}_{17}\text{H}_{24}\text{O}_{10}$ ,  $\text{C} = 52.57$  per cent.;  $\text{H} = 6.18$  per cent. A molecular weight determination by the freezing point method gave 377. The above formula requires 388. The average of two tests for methoxyl gave 7.48 per cent. One  $\text{OCH}_3$  requires 7.98 per cent.

Cornin thus appears to be a glucoside whose molecule contains the glucose nucleus and, so far as determined, is represented by the formula  $\text{C}_{16}\text{H}_{21}(\text{OCH}_3)\text{O}_9$ .

*The Selective Antiseptic Action of Copper Salts:*  
ALFRED SRINGER.

Last year I found a certain Cincinnati "certified milk" contaminated with traces of copper salt, which in some cases, though containing only one part in two millions, decidedly affected the normal sequence of fermentative action and made the milk a better medium for the growth of certain molds. In the course of my experimentation I found that the copper salts were highly selective, being most efficient in inhibiting the putrefactive germs, as evidenced by tests made with egg albumin, blood albumin, meat and other nitrogenous substances, with and without the addition of copper salts. These results may be caused either by the copper salts preserving the substances in their original condition, or splitting them without the formation of odorous compounds or dissociating the odorous compounds themselves into non-odorous ones.

It seemed to me that some light might be thrown upon the action of these salts by experimenting with copper treated eggs and then placing them in an incubator. In the first series of experiments I completely submerged many eggs in a cupric sulphate solution and check ones in distilled water. Those in the distilled water kept about two months, the others after a year's time have not become foul. When, however, eggs which had been completely submerged several weeks in a copper or distilled water solution, were placed in an incubator no chickens hatched. The distilled water experiments showed that it is fatal to prevent air from reaching the germinative part of the egg. The preservative effects of the copper salts might have been due to their rendering the eggs to a condition similar to that of unfertilized ones (which keep far better than the fertilized)

or inhibiting the putrefactive microorganisms without effecting germinative properties. In order to determine this, I made another series of experiments by placing eggs upright in copper and distilled water solutions with the broad end projecting above the liquid so that air could enter into that part. In another set, one half of the egg was longitudinally immersed in copper sulphate solutions and distilled water twenty-four hours, then turned so that the other half would be immersed twenty-four hours, but at all times air had free access through the upper half. After seventeen days' treatment, these eggs as well as some check untreated ones were placed in the incubator. On the twentieth day a chick hatched from an egg which had been three quarters immersed in distilled water seventeen days. I waited five days longer, and, no other chick coming out of any shell, I opened the eggs and found that two of the fertile ones had almost completely developed. One of these was from a partly submerged egg and the other from alternately immersed and daily turned one.

From the eggs containing the chicks, I sucked up part of the liquid with a pipette, digested it with sulphuric acid in a Kjeldahl flask and tested for copper. It was not even necessary to digest the liquid, as it could be diluted with water and electrolyzed direct, the copper depositing on the cathode. This evidently showed, as you see by these specimens, that embryonic growth to almost complete development took place, although the imbedded liquid was practically a copper bath. While these experiments are still very incomplete, it strikes me all signs point to the belief: that small amounts of copper salts in their selective antiseptic action towards the putrefactive ferments and unpronounced effects on others, may be of great therapeutical value.

#### *Destruction of Invertase by Acids and Alkalies:*

H. S. PAINE.

Samples of the same invertase preparation were kept at a constant temperature of 30 degrees for different time intervals in acid (HCl) and alkaline (NaOH) solutions at varying concentrations. At the end of the respective time periods all the samples were brought to the same acidity (the acidity favorable to optimum activity of the enzyme) in cane sugar solutions of the same strength, all volumes being equal. After an inverting action of one hour, the velocity coefficient,  $K$ , of the rate of the inversion was calculated from the formula for monomolecular reactions, viz:  $K = 1/t \log (R_0 - R_\infty / R - R_\infty)$ , where  $R_0$

is the rotation of the pure cane sugar solution,  $R_\infty$  the rotation of the same solution after complete inversion and  $R$  the polarization at the time  $t$ , seconds and decimal logarithms being used in the calculation. The activity of the enzyme, as measured by the above coefficient,  $K$ , was found to decrease as the strength of the destroying acid or alkali solution was increased.

By an application of the above formula a coefficient,  $K'$ , measuring the rate of destruction of the invertase was obtained as a derived value of the coefficient just referred to.

Destruction commenced at about 0.015 normal in acid and 0.01 normal in alkaline solution, requiring about five to six hours for completion at those concentrations. It was very rapid and required only about five minutes in 0.05 normal acid and 0.04 normal alkaline solution, showing that, while invertase is inactivated in very faintly alkaline solutions, the destructive action of alkalies on it is not much greater than that of acids.

In view of the fact that the degree of acidity or alkalinity of the media in which many enzymes naturally occur is subject to change, quite often between wide limits, investigations, such as the one just described, are of value in determining just when inactivation or destruction takes place. As only one instance of such media of changing acidity and alkalinity may be mentioned the alimentary tract of the higher animals, considered in its entirety.

#### *The Estimation of Arsenic and Morphine in Animal Tissue:* CHARLES R. SANGER.

One three-thousandth part of an ounce of arsenic and one thousandth part of an ounce of morphine can readily and quickly be detected by the new method, and it is expected that all uncertainty in post mortem examinations will be eliminated by the new method of analysis.

#### *Stagnation vs. Circulation in House Air:* ELLEN H. RICHARDS.

The science of living is more and more engaging the attention of those who are exploring the borderland of chemical physics of chemical biology. No part of this land is more unknown than the air we breathe and its significance in mental activity.

In no quarter do we do greater wrong than to our young students, by compelling them to listen to lectures, and to work, in an atmosphere that dulls their wits and befores their minds. It is quite time that the biophysicist wrote a convince-

ing tract on draft and its necessity. Let us take advantage of the tuberculosis scare and change the habits of people so that they may not need to drop all their occupations and sit in a draft all day doing nothing.

An artificial life demands artificial means of securing the advantages of natural living. One man's fresh air is another man's draft and the most difficult part of the ventilation problem is to reconcile the interests of both these classes of persons.

It is now pretty generally recognized among the scientific workers most familiar with the facts, that there is little danger from breathing germs except from direct contact with the particles given off by sneezing, coughing, etc., and this only within a radius of ten feet or so of the distributing factor. Also that in itself carbon dioxide, up to even 50 or 75 parts in 10,000 does not disturb the individual in a cool, dry room.

The window lowered an inch at the top is of more power than raised a foot at the bottom. Because air is invisible, the average person ignores it. If more attention could be paid to air currents, to the mixing of air, and as an aid to this, if the air of halls could be kept cooler, vast benefit would result. Heat and humidity are the most dangerous products of still life, because they so soon endanger the activity of the cells and raise the body temperature.

Odors also form no unimportant part in the causes for discomfort in our enclosed spaces. May not circulation of air combined with ozonization do much to eliminate this? We have tests under way looking to this end.

The following papers are reported by title:

*Industrial Bacteriology as a Field for Biochemical Investigation:* SAMUEL C. PRESCOTT. (Chairman's address.)

*Studies upon the Physiological and Chemical Toxicology of the Sap of the Manzanillo Tree:* JOSE A. FERNANDEZ BENITEZ.

*Some Points in the Analysis of Proteins:* T. B. OSBORNE.

*A Method for the Determination of Amino Nitrogen and its Applications:* DONALD D. VAN SLYKE.

*The Anaphylactic Reaction as a Specific Test for Protein:* M. J. ROSENAU.

*The Manganese-bearing Tissues of the Fresh-water Mussels:* H. C. BRADLEY.

*The Relation of Typhoid Fever to the Water Supplies of Illinois:* EDWARD BARTOW.

*The Action of Enzymes on Sugars:* C. S. HUDSON.  
*The Cause of Depression Produced by Molasses:* J. B. LINDSEY.

*The Chemical Organization of a Typical Fruit:* A. E. VINSON.

*Fixing and Staining Tannin in Plant Tissues:* A. E. VINSON.

#### DIVISION OF ORGANIC CHEMISTRY

R. S. Curtiss, *Chairman*

Ralph H. McKee, *Secretary*

*Advances in the Chemistry of Coal-tar Colors:* HUGO SCHWEITZER.

Enormous progress is yearly made in the industry of coal-tar colors where the far-reaching possibilities of chemistry have been recognized. It is the popular idea that aniline colors can not stand the influence of light. This is due to the fact that the first aniline colors were poor. This is not true of the aniline colors now made. The most wonderful advances in the production of new colors of extreme fastness are to be found in the class of alizarin colors, which for the last twenty years have played a very important part in the dyeing industry.

Many interesting experiments have been made to determine the fastness of certain dyes, among them the experiment of dyeing a blue fabric and exposing it to the sun's rays at the height of many thousand feet. Since a method has been discovered for the manufacture of artificial indigo economically, many different kinds of dyes have been made from this indigo, which plays an important part in the industry. Friedländer has made some interesting investigations to show that the purple of the ancients, which was derived from purple shell fish of the Mediterranean, was identical with some of the modern derivatives of indigo. From 12,000 shell fish he obtained one twentieth of an ounce of color, which shows why it was so precious and expensive in the olden times.

Within a few years it has even been possible to make coal-tar colors for the use of artists. While the product in Thessaly of a few pounds of dye-stuff would be sufficient to supply the painters of the world with this color it is practically nothing. Experiments were carried out for the benefit of art. They are being continued so that in the end organic colors will reign supreme in this field.

A comparison of the natural colors of a few years back with the artificial colors of to-day show that in every case the artificial colors are

much better as well as cheaper, while the variety of shades that can now be obtained is almost infinite. The much-vaunted achievements of the good old times are of necessity a myth as far as fastness of dyes or superiority of textiles are concerned, and the purple and fine linen of the ancients would look decidedly queer in a modern department store. The fabrics which the daughters of the Pharaohs used for their personal adornment would not find favor in the eyes of the poorest women of the present day.

*Saponification of Formic Esters:* J. STIEGLITZ and EDITH BARNARD.

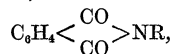
The velocity coefficient for the saponification of ethyl formate by the hydroxyl ion at 25° was determined by means of a mixture of ammonium hydroxide and chloride and found to be 1,840. For methyl formate the constant 2,800 was found. At the same time there is amide formation, the constant for which was found to be 0.13 for methyl formate at 25°.

*Stereoisomeric Chlorimidoketones:* J. STIEGLITZ and P. P. PETERSON.

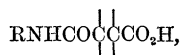
Stereoisomeric chlorimido-p-chlorbenzophenone, chlorimido-p-methoxybenzophenone and chlorimido-p-chlor-p-methoxybenzophenone were described.

*Phthalamidic Acids Substituted in the Benzene Nucleus:* J. BISHOP TINGLE and S. J. BATES.

It has been shown by the senior author and his co-workers that phthalamidic acids,  $\text{RNHCOC}_6\text{H}_4\text{CO}_2\text{H}$ , when warmed with amines are transformed readily into imides,



and other products. Aliphatic amidic acids of a similar type,



under similar conditions, fail to react in this manner and their salts with amines are also stable. The investigation has been extended to include several amidic acids derived from 3-nitro-, 4-nitro-, 3,6-dichloro- and tetrachlorophthalic acids, in which R as in the formula above is phenyl- or  $\beta$ -naphthyl-. The general effect of these substituting groups (Cl or  $\text{NO}_2$ ) is to render the amidic acid very stable towards amines, but it is readily changed to the imide by the action of alcohol which may be as dilute as 50 per cent. The reaction is not produced by other solvents under similar conditions of temperature.

Camphor phenyl- and  $\beta$ -naphthylamidic acids

are not dehydrated by amines. Camphoric acid therefore behaves like an aliphatic compound.

*Melting and Boiling Points of Certain Disubstitution Products of Benzene.* By J. BISHOP TINGLE.

The statement, which is rather widely current, that para disubstituted benzene derivatives usually melt and boil at a higher temperature than the isomeric ortho- and meta-compounds requires qualification, as is shown by the following results:

*Boiling Points.*—(1) The b. p. increases in the order ortho-, meta- and para- in the case of compounds containing the substituents Cl, OH; Br, OH; I, OH (?); OH ( $\text{OH}$ )<sub>2</sub>;  $\text{CH}_3$ ,  $\text{NO}_2$ ;  $\text{CH}_3$ ,  $\text{NO}_2$ ;  $\text{C}_2\text{H}_5$ ,  $\text{NO}_2$ ;  $\text{CH}_3$ , Br;  $\text{CH}_3$ ,  $\text{CO}_2\text{H}$ . (2) The b. ps. of the meta- and para-compounds are essentially identical and are lower than those of the ortho-derivatives when the substituents are  $\text{CH}_3$ , Cl; ( $\text{CH}_3$ )<sub>2</sub>; ( $\text{C}_2\text{H}_5$ )<sub>2</sub>;  $\text{Cl}_2$ ;  $\text{Br}_2$ ;  $\text{I}_2$  (?); Cl, Br; Br, I; Cl, I (?); ( $\text{NO}_2$ )<sub>2</sub> (?); HO,  $\text{NO}_2$  (?); Cl,  $\text{NH}_2$ ; Br,  $\text{NO}_2$ . (3) The b. p. rises in the order meta-, ortho-, para- in the case of the compounds,  $\text{CH}_3\text{CH}_2\text{CH}_2$ ,  $\text{CH}_3$ ;  $\text{C}_2\text{H}_5$ ,  $\text{NH}_2$ ; ( $\text{NO}_2$ )<sub>2</sub> (?); HO,  $\text{NO}_2$  (?). (4) The increase of temperature is in the order meta-, para-, ortho- with the substituents Cl,  $\text{NO}_2$ ;  $\text{I}_2$  (?); HO,  $\text{NO}_2$  (?). (5) The increase is in the order para-, meta-, ortho- in the case of Cl, I. This is the converse of 1. (6) The order is ortho-, para-, meta- with the groups ( $\text{NH}_2$ )<sub>2</sub>. (7) The b. p. of the ortho- and meta-compounds are essentially equal, that of the para-derivative being higher in presence of  $\text{CH}_3$ , I. (8) The b. p. of the ortho- and para-derivatives are substantially equal, those of the meta-compounds being higher or lower in the case of  $\text{C}_2\text{H}_5$ , Br; ( $\text{CH}_3$ )<sub>2</sub>CH,  $\text{CH}_3$ .

*Melting Points.*—The m. ps. of the substances mentioned above are much more simple. The following come under class (1) above: HO, Cl (?); HO, Br (?); ( $\text{OH}$ )<sub>2</sub>; HO,  $\text{NO}_2$ ;  $\text{H}_2\text{N}$ ,  $\text{NO}_2$ ; Cl,  $\text{NO}_2$ ; Br,  $\text{NO}_2$ ; ( $\text{CO}_2\text{H}$ )<sub>2</sub> (?);  $\text{H}_2\text{N}$ ,  $\text{CO}_2\text{H}$ ;  $\text{CH}_3$ ,  $\text{CO}_2\text{H}$ ;  $\text{H}_2$  (in the case of  $\text{C}_6\text{H}_4\text{I}_4$ );  $\text{I}_2$ ;  $\text{CH}_3$ ,  $\text{NO}_2$ . The remaining compounds fall into class (3) above. They are as follows: I,  $\text{NO}_2$ ; Br,  $\text{NH}_2$ ; I, OHX; I,  $\text{NH}_2$ ; HO,  $\text{NH}_2$ ; ( $\text{NO}_2$ )<sub>2</sub>;  $\text{O}_2\text{N}$ ,  $\text{CO}_2\text{H}$ ;  $\text{C}_2\text{H}_5$ ,  $\text{CO}_2\text{H}$ ; ( $\text{NH}_2$ )<sub>2</sub>.

No m. ps. have been found which correspond to the relationship shown in the b. ps. of the compounds in classes (2), (4), (5), (6), (7) and (8). The small number of substances in the last four classes suggests that the published data may require correction. The classification given above is based on the best figures which were available,



but from the nature of the case, the degree of accuracy attained by different investigators is very variable. In the case of compounds followed by (?) the classification is open to doubt.

*Hydrazones of Certain Oxy-Ketones; Alkali-Insoluble Phenols:* HENRY A. TORREY.

Although it is a very general rule that phenols are soluble in aqueous alkalis there are certain substances of this class that are marked exceptions. The phenylhydrazones of certain acetophenols and acetophenols are entirely insoluble in aqueous alkalis. This alkali-insolubility is determined by two conditions: (1) the free hydroxyl group is ortho to the substituted ketone side chain; (2) other substituting groups, as  $\text{OCH}_3$ , or hydrocarbon groups are present.

The importance of the second condition is seen in the fact that while the phenylhydrazone of o-oxyacetophenone is soluble in aqueous alkalis, the same derivatives of paeonal or a-acetonaphthol are insoluble. The azines of a-acetonaphthol is insoluble in aqueous alkalis, whereas in general the azines have been found soluble, even though the phenylhydrazones are insoluble. No condensation between the imino and hydroxyl groups has taken place. There seems to be no evidence to suggest that these alkali-insoluble phenols should be weaker acids than corresponding bodies that are soluble. The acetyl derivatives obtained by Auselmino from similar alkali-insoluble phenylhydrazones of oxyphenylaldehydes point to the presence of the hydroxyl group. It is possible that the consideration of a quinoid structure may assist in the explanation of the alkali-insolubility of these compounds. They furnish an interesting instance of the effect that a substituting group may have upon the whole equilibrium of the molecule.

*Furoylacetic Ester and Furyl-Pyrazolones:* HENRY A. TORREY and J. E. ZANETTI.

Furoylacetic ester, as might be expected, closely resembles acetacetic ester and benzoylacetic ester. Its oxime, however, is more stable, although it can be converted into the corresponding isoxazolone without difficulty. The comparative stability of the oxime shows that the furyl group has a greater attraction for the hydroxyl of the oxime radicle than would be indicated by the position assigned to it by Hantzsch in his list of groups arranged in order of their power of attraction for hydroxyl in this class of compounds. Since pyromucic acid has a considerably higher dissociation constant than either benzoic acid or

acetic acid, the comparative stability of the oxime of furoylacetic ester is better explained by the views of Abegg, according to which the difference in electrical charges of the groups influencing the hydroxyl of the isonitroso group is considered.

Furoylacetic ester forms hydrazolones easily with hydrazines, thus with aryl hydrazines, 1-aryl 3-furyl 5-pyrazolones are given. As would be expected, these pyrazolones show tautomeric relationships. With benzaldehyde a condensation product was formed with one molecule of the pyrazolone and with diazo salts highly colored azo compounds were prepared. Acetyl and benzoyl derivatives were readily formed.

From 1-phenyl 3-furyl-5-pyrazolone by the action of methyl iodide the hydriodide of 1-phenyl 2-methyl 3-furyl-5-pyrazolone was obtained, an analogue of the drug "antipyrine." Other salts, such as the hydrochloride and hydrobromide, were made, but owing to the negative nature of the furyl group they are easily hydrolyzed by water giving the free body in the form of an oil difficultly soluble in water.

*Methyl Phenyliminomalonate and its Reactions:*

RICHARD SYDNEY CURTISS and F. GRACE C. SPENCER.

This compound  $\text{C}_6\text{H}_5\text{N}=\text{C}(\text{CO}_2\text{CH}_3)_2$  is made by the action of  $\text{P}_2\text{O}_5$  on methyl anilinetartrate, the addition product of aniline on methyl oxomalonate. It shows remarkable reactivity at the nitrogen-carbon double bond. Moisture of the air rapidly changes it to methyl dianilinomalonate and methyl dihydroxymalonate; a complex reaction, involving the formation of aniline and methyl dehydroxy malonate and their interaction to produce the final products. Aniline acts on methyl phenyliminomalonate giving methyl dianilinomalonate. Alcohols, amines and many other classes of compounds containing easily dissociable hydrogen, add directly to the double bonds. The substance is a striking analogue of phenylisocyanate. Mercuric oxide oxidizes methyl anilinomalonate yielding methyl dianilinomalonate and methyl oxomalonate. This reaction is complex and its mechanism may be explained by assuming that methyl anilinetartrate first formed dissociated to methyl phenyl iminomalonate, and that this was changed by water into the final products as stated above. Further studies are in progress on phenyliminomalonates.

*On 4- and 5-acetamino Acetantranils and Quinoxalines derived therefrom:* M. T. BOGERT and C. G. AMEND.

2, 4- and 2, 5-tolylene diamines were acetylated, the acetyl derivatives oxidized to the corresponding diacetamino benzoic acids, and the latter converted into the acetamino acetanthranils by boiling acetic anhydride. By condensing these acetamino acetanthranils with primary amines, and other primary amino compounds, acetaminoquinazolines were obtained, from which the acetyl group was easily removed, leaving amino quinazolines whose amino groups were then subjected to various well-known aniline reactions.

*The Preparation of Styrolene Alcohol:* WM. LLOYD EVANS and LOU HELEN MORGAN.

Styrolene diacetate can be prepared quantitatively by the interaction of fused lead acetate (1.5 mols.) and styrolene diacetate (1 mol.) dissolved in glacial acetic acid (six times the weight of the dibromide used). The reaction begins at 120° and is practically complete at 125°. Styrolene alcohol can be prepared by the hydrolysis of styrolene diacetate (1 mol.) by means of potassium carbonate (1.5 mols.) dissolved in water (twenty-five times the weight of the diacetate used), the solution being kept to boiling for two hours. From the cooled reaction mixture, subsequently saturated with potassium carbonate, the greater portion of the alcohol may be precipitated, the remainder being obtained from the filtrate by extracting with ether. Oxidation experiments are now in progress on styrolene alcohol and also on propylene glycol.

*The Glycogen Content of Beef Flesh:* P. F. TROWBRIDGE and C. K. FRANCIS.

The experiment in enzymatic hydrolysis has been continued on similar lines to those reported in the previous paper, working on the liver of beef animals instead of the shoulder muscle. At temperature of 20° to 25° a liver, containing 3.15 per cent. glycogen when exposed for about three days contains about 2 per cent. of glycogen.

Various authorities state that horse flesh contains from 1 to 2.4 per cent. glycogen and it is claimed the muscle of the ordinary horse has as much glycogen as the liver. Our investigations have not confirmed this assertion. Working on a sample of fresh horse flesh obtained from a thin animal about twenty years old, we have obtained only 0.18 per cent. glycogen in the muscle. In twenty-one hours this amount was decreased 67.3 per cent., while in three days the loss was 91.1 per cent., accompanied with a slight decomposition of the sample. In the fresh shoulder muscle of beef we have found as high as 0.7 per cent. of

glycogen as previously reported. According to these results the determinations of the glycogen as distinguishing horse flesh from beef is of no value.

The following papers are reported by title:

*Synthetic Medicinals: Recent Progress in Relationship between Physiological Action and Structure:* VIRGIL COBLENTZ.

*The Action of Acetylene on Iodine Trichloride:* H. EDMUND WIEDEMANN.

*The Condensation of Methyl-ethyl-ketone by Acids and Alkalies:* ALFRED HOFFMAN.

*The Constitution of Retene and its Derivatives:* JOHN E. BUCHER.

*The Properties of the Hexa-substitution Products of Ethane:* JAMES F. NORRIS.

*Studies in Tautomerism:* S. F. ACREE.

*The Basic Properties of Oxygen; Compounds of Dimethylpyrone and the Halogen Hydrides:* D. MCINTOSH.

*The Constitution of Ortho-benzo-quinone:* WM. MCPHERSON and HOWARD J. LUCAS.

*Esterification and Steric Hindrance:* M. A. ROSANOFF, C. D. WRIGHT and T. F. POWER.

*The Constitution of the Carboxonium Salts:* M. GOMBERG and L. H. CONE.

*The Constitution of the Carbothionium Salts and of the Acridine Salts:* M. GOMBERG and L. H. CONE.

*The Constitution of Benzene from the Standpoint of the Corpuscular-atomic Conception of Positive and Negative Valences:* HARRY SHIPLEY FRY.

*The Formation of Cyclopentadiens:* WILLIAM J. HALE.

*Some Organic Compounds of Selenium:* HOWARD W. DOUGHTY.

*A Measure of Thermodynamic Positivity and Negativity in Water Solution with Reference to Chemical Reactions of Organic Compounds:* C. G. DERICK.

*The Addition Power of Methylene-ethylene:* ROGER F. BRUNEL.

*Equilibrium at High Temperatures between Isobutyl Bromide and Tertiary Butyl Bromide:* ROGER F. BRUNEL.

*The Iodine Compound of Pinene and the Resin formed by the Action of Iodine on Pinene:* G. B. FRANKFORTER and B. F. P. BRENTON.

#### CHEMICAL EDUCATION SECTION

Lyman C. Newell, *Chairman*

*The Purpose and Method of the Chemistry Course in the Public High School:* FRANK B. WADE.

The author first classified his material into three groups: (a) those who expect to go to college, (b) those who wish to use their chemistry vocationally, (c) those who wish chemistry as part of a good general education. He regarded (a) as a majority of influence, but (c) as a numerical majority. He next showed that the best course for class (a) would really serve classes (b) and (c) better than any other course.

Going more into detail, it was shown that for all three classes the course should be along broad general lines. The fundamental principles, the leading facts and the most useful theory should be taught. More than all else the scientific mode of thinking should be inculcated, together with the habit of going to things themselves rather than to authorities for facts. The ability to attack hard problems systematically and successfully should be imparted to the pupils.

This sort of course was shown to be the best possible preparation for college chemistry, also for vocational chemistry and for general training.

In the last part of his paper the author took up briefly the matter of how the kind of course outlined might be taught, and attempted to convey an idea of the spirit of the method rather than pedagogic details of method, placing emphasis upon open mindedness and breadth rather than upon specialization in high school chemistry.

*Content and Method of the First Course in Chemistry:* M. D. SOHON.

The social development has been so largely shaped through the application of scientific principles that an understanding of the elementary principles of physics and chemistry is necessary for the ordinary man.

The introductory course should be so adapted as to be within the capacity of any child in the high school. It should be planned for the many rather than the few.

The content of the course should be such as to give a comprehensive view of the principles involved in *ordinary* chemical phenomena, together with non-technical treatment of commercial products, their sources, utilization and preparation.

The difficulties of the subject are largely artificial and due to acceptance of traditional methods and content. The theoretical conceptions are difficult, but fortunately such are not essential to the study of the principles involved in the elementary study of the subject.

This can be done better with elementary pupils by the systematic study of topics and of processes

than by the study of elements. Traditional methods followed by texts fail to make use of modern experiences and facilities in their method and arrangement. The subject should be approached from the side of the pupil, sacrificing, if necessary, the formal development as a science.

Laying aside the old methods and examining the subject from the side of the pupil, there is ample material to be drawn upon, facts worth knowing. Their relations and values may be taught with little or no regard to abstractions.

For the pupil who will continue in school it will serve as a foundation for more intensive work. The pupil who does not continue will have had his interests aroused to increased efficiency.

Pressure should be brought to bear upon the schools to make the instruction more practical. It is within the power and is the duty of the society to meet this and say what is desirable or practical and not leave this to popular clamor or self-constituted authorities.

*The Relations of the Common and of the more Uncommon or Immiscible Reagents:* CHARLES S. PALMER.

A short paper urging the teaching of the action of the common acids, bases and salts on the common oils, fats, waxes, and such substances as paper, sizing, ink, cotton, wool, etc. All this should be shown the beginner, and adopted and incorporated with the usual good theory and practise. This means more thorough courses in preparatory chemistry comparable with the completeness and thoroughness of the good old-fashioned specializing in Latin and Greek. This toning up of preparatory chemistry should come from the inspiration and insistence of the college influence on the preparatory school.

*Elementary Chemistry in the Vocational High School:* LYMAN GORHAM SMITH.

The vocational school trains for efficiency in special lines of work, and generally makes but indirect use of chemistry. Employers are demanding that the pupil acquire habitual knowledge, or that he be well drilled; educators, on the other hand, unanimously emphasize the value of the development of initiative, and of the power of independent judgment. The latter must be protected, as it is against the best interests of pupils to make them merely the profitable tools of employers. Schools can do much to train more efficient and useful workers, but the spirit of ideal democratic American education is not to be neglected.

The scientific attitude of observing accurately and drawing sensible conclusions is a most essential element in vocational education. Plato, Leonardo da Vinci, Charles Kingsley and many others, including a host of theoretical and practical modern educators, are earnest advocates of the scientific method. The spirit of investigation is natural to even young children. Leaders in pedagogy and in science in England, in Germany and in America are promoting inductive laboratory study. Vocational high schools need to train pupils for power of judgment, must teach fundamental principles, and such cases of the practical applications of chemistry as are typical. The difference between factory and laboratory practise should be made clear. Works should be visited, and a few experiments, at least, should be carried out on a commercial scale by the pupil. Much real inductive laboratory study is essential at the start, and an acquaintance with the spirit of the methods of attacking practical experimental problems should be gained. Above all, at the beginning of the study of chemistry, the pupil should be made independent of text-books, the authority of which he should learn to regard with discriminating suspicion; though later he may use them to some advantage. Many of the subjects taught in high schools, as algebra, depend on text-books, but the peculiar quality of science instruction lies in the cultivation of the scientific attitude. The conscientious pursuit of truth is an important moral element in education. Efficiency in vocational education results from accurate and reliable knowledge, respect for scientific methods, regard for the evidence furnished by data, and appreciation of the value of the work of experts.

*The Case Against Qualitative Laboratory Experiments:* EDWARD ELLERY.

The case against qualitative laboratory practise is as follows:

1. It is a waste of the student's time to repeat in the laboratory what has been done in the lecture room. There is so much to give now like the thermal and electrical relations that time can not be spared for the student to find out whether an element acts or does not act as the book says.

2. The student gets a wrong idea of the rigidity of the laws and the care and accuracy necessary in chemical work by his careless performance of the experiments.

3. Such qualitative experiments do not make for independence. The notes can be written up from what is given in the books or seen in the lecture

room. Such work is not the most profitable use to make of one's time.

4. Good results are often not obtained, due to use of faulty apparatus, hurried work and careless use of materials.

The advantages of doing quantitative work are pointed out. They may be summed up as follows: (1) quantitative experiments are not beyond the capacity of beginners, (2) quantitative work emphasizes the chemistry of the reactions and demands more critical observation, (3) the cost of fitting up a quantitative laboratory need not be large, (4) the experience gained in quantitative experiments will be of use later on when the student does analytical work.

*The Teaching of Chemistry in Secondary Schools:* MOSBY G. PERROW.

It is pointed out in this paper that too much is attempted in a one-year course in a secondary school. This is due to the severe entrance requirements of some colleges and to the very many subjects given in the text-books. As a result no thorough careful work is done and the student gets discouraged at the amount of work he has to do.

*Educational Value of Chemistry:* W. S. LEAVENWORTH.

The difference is brought out between a study of the classics and a study of physical science. The advantages of laboratory work are given in which it is shown that it cultivates clear thinking and right doing, develops perception and the rational faculties and inculcates the capacity for honest, thorough work. In the laboratory the student learns by doing and does by learning. The laboratory demands accuracy of eye, teaches necessity for care, exactness and cleanliness. The imagination also has a place in chemistry, as we see from Dalton and Mendeleeff. Chemistry is an enemy to superficiality; it cultivates clear expressions and exact thought, in a broad way it teaches us why and how to live. Science in its best and broadest sense gives us the only rational explanation of living and therefore is essential to any system of education.

*A Method of Preparing Qualitative "Unknowns":* L. J. CURTMAN.

The stock solutions are prepared of strength indicated in column 5 (except in cases where the solubility of the salt will not permit of such a concentration) and kept in bottles of one or two liters capacity provided with graduated pipettes. We are thus able to deliver definite quantities of

Substance	Formula Weight	Solubility in 100 pts. of Water at 20°	Per Cent. Metal	Quantity of Salt to be Dissolved in 1 Liter to Give Strength 1 c.c. = 100 mgs. of Metal
NaCl	58	35 g.	40	250
KNO <sub>3</sub>	101	25	39	257
NH <sub>4</sub> NO <sub>3</sub>	80.1	200	22.5	445
BaCl <sub>2</sub> ·2H <sub>2</sub> O	244	41	56	180
Ca(NO <sub>3</sub> ) <sub>2</sub> ·4H <sub>2</sub> O	236.2	extremely soluble	17	590

these standard solutions to students as "unknown" bottles; these consist of homœopathic vials of 50 c.c. capacity. For the analysis the student takes 25 c.c. of his solution, the other half being reserved in case of accident.

The amounts of standard solutions pipetted out should be such as to yield a suitable concentration when the volume is diluted to 50 c.c., *i. e.*, when the bottle is filled.

Example: Pipetted out into "unknown" bottle: 1 c.c. NaCl sol, 2 c.c. Ca(NO<sub>3</sub>)<sub>2</sub>, 1 c.c. NH<sub>4</sub>NO<sub>3</sub>, and then fill the bottle with distilled water.

Since the student uses only 25 c.c. of this solution the latter will contain: 50 mgs. Na, 100 mgs. Ca, 50 mgs. NH<sub>4</sub>.

The following papers were reported by title:

*Conditions under which Secondary School Teachers Conduct their Work:* ALBERT L. SMITH.

*Conditions and Equipment in Secondary Schools:* CHARLES R. ALLEN.

*Elementary Chemistry Teaching as a Means of Developing the Power of Independent Scientific Reasoning:* ARTHUR A. BLANCHARD.

*The First Course in Chemistry for Secondary Schools:* M. D. SOHON.

D. L. RANDALL,  
Press Secretary

#### SOCIETIES AND ACADEMIES

##### THE GEOLOGICAL SOCIETY OF WASHINGTON

At the 225th meeting of the society, held on Wednesday, January 12, Mr. Fred. E. Wright exhibited specimens of obsidian from Hrafninnuhryggur, Iceland, with peculiarly pitted surfaces, resembling the markings of the Austrian moldavites; also a unique type of crystallization of radial spherulites in cavities of that obsidian.

Mr. David White exhibited a photograph of an unusually large and complete *Stigmara* stump, taken in an anthracite mine near Scranton, Pa.

It afforded an excellent illustration of a "kettle bottom" or "pot," a common source of danger in coal mines, and clearly showed the hole in the roof above the fallen stump.

Mr. Chas. Butts described a Carboniferous coal bed overlain by Lower Cambrian limestone, near Aldrich, Ala., the limestone being thrust over the coal at the fault bounding on the east the Carboniferous rocks of the Cahaba trough. The coal is completely overturned, lies flat at the exposure, and is unchanged except for being crushed and mixed with shale.

#### Regular Program

##### *Influence of the Earth's Rotation on the Lateral Erosion of Streams:* H. M. EAKIN.

Observations on Alaska rivers indicate a higher efficiency of the deflective force of the earth's rotation in determining lateral erosion of streams than has been ascribed to it. The Yukon River and its tributaries, the Tanana, Koyukuk and Innoko, and the Kuskokwim, all large Alaska streams, show a marked predominance of erosion on the right bank. The strength of the deflective force as computed and compared at different latitudes shows it to be much stronger in the higher latitudes. For instance, for latitudes 5°, 25°, 45° and 65°, the ratios are approximately 1 to 4.8 to 8.0 to 10.3. The effectiveness of the deflective force may be compared with that of the centrifugal force of various curves of rivers, that of the deflective force at latitude 65° being approximately equivalent to that of the centrifugal force developed on a curve having a radius of 6.2 miles, computations being based on an assumed velocity of 2 meters per second. The lateral stresses due to either centrifugal force or deflective force tend to establish cross gradients which would oppose them. The lateral stresses being weaker in the lower part of the stream, the stronger lateral gradient supported by the upper part of the stream sets up an undertow in a direction opposite to that of the lateral stresses. The results of the boring currents thus produced are expressed in selective cut and fill. The deflective force being to the right in the northern hemisphere combines with the centrifugal force on right curves and opposes it on left curves. On straight reaches the deflective force acts alone. In a meandering stream the lateral gradients are reversed on successive bends and the lateral stresses are not fully expressed in lateral currents, since they are under conditions of acceleration much of the time. On straight reaches, there