THE AMERICAN CHEMICAL SOCIETY

THE sixty-fourth gentral meeting of the American Chemical Society was held at the Carnegie Institute of Technology, Pittsburgh, Pa., on Tuesday morning, September 5, 1922. Short addresses were given by J. O. Handy, chairman of the Pittsburgh Section, John G. Bowman, chancellor of the University of Pittsburgh, and Thomas S. Baker, acting president of the Carnegie Institute of Technology. Dr. Edgar F. Smith responded on behalf of the society. The address of Edward E. Slosson on "The constructive chemist" was the feature of the morning and was heartily enjoyed by all those who had the privilege of hearing it. No business was transacted at the general meeting.

The following addresses were given at the afternoon session in the Carnegie Music Hall: "The chemical control of gaseous detonation with particular reference to the internal combustion engine," by Thos. Midgley, Jr., and T. A. Boyd; "The journal literature of chemistry," by E. J. Crane; "Structural colors in feathers," by Wilder D. Bancroft; "How research made a potash industry," by John E. Teeple.

On Tuesday evening a complimentary smoker was given the members as guests of the Pittsburgh Section at the Syria Mosque. There were 1,325 people present. A very interesting program, with songs, local vaudeville entertainment, moving pictures, etc., was enjoyed by all. On Wednesday at 2 P.M. a conference on "World Metric Standardization," with Eugene C. Bingham, chairman, was held in the theater of the Fine Arts Building with the following delegates present:

American Chemical Society: Eugene C. Bingham.

National Academy of Sciences: T. C. Mendenhall.

American Society of Zoologists: Dr. H. H. Collins.

American Psychological Association: Professor W. V. Bingham.

American Institute of Electrical Engineers: N. W. Storer.

American Metric Association: W. W. Stevenson.

Optical Society of America: Harry S. Hower.

United States Bureau of Standards: F. S. Holbrook.

New York Mineralogical Club: Dr. George F. Kunz (Absent).

American Statistical Association: Professor Roswell H. Johnson.

Geological Society of America: Professor Roswell H. Johnson.

Association of Seed Analysts: Dr. E. M. Gress.

American Electrochemical Society: R. E. Zimmerman.

American Pharmaceutical Association: Dean J. A. Koch.

National Society for the Study of Education: J. Freeman Guy (Absent).

American Astronomical Society: Professor Herman S. Davis.

Maryland Academy of Science: Dr. Claude H. Hall.

American Association of University Professors: Professor Alexander Silverman.

Ecological Society of America: A. E. Ortman (Absent).

American Institute of Architects: T. E. Billquist.

American Society of Biological Chemists: Howard B. Lewis (Absent).

American Society of Civil Engineers: R. A. Cummings.

American Mathematical Society: Professor F. L. Bishop.

American Medical Association: Dr. Paul N. Leech.

American Physiological Association: Dr. C. C. Guthrie.

American Public Health Association: Dr. Wadsworth.

Illuminating Engineering Society: E. J. Edwards.

Mathematical Association of America: Professor F. L. Bishop.

Sullivant Moss Society: Dr. O. E. Jennings.

The same evening a reception was held and President Edgar F. Smith gave the annual presidential address under the title "Our Science." On Thursday evening a garden party, followed by supper and an out-of-door dramatic entertainment, "The Wonder Hat," was the chief entertainment of the meeting. The party was held at "Oak Manor," which is the University of Pittsburgh faculty and Mellon Institute club house. The weather was ideal. Some 1,500 persons were present and a thoroughly delightful social evening, including

also music and dancing, was enjoyed by all. On Friday, excursions were made to the Carnegie Steel Company's Clairton by-product coke plant, the steel works and to the American Window Glass Company's plant at Monongahela City. The ladies were entertained throughout the week with receptions, dinners and excursions. Further details will be found in the October issue of the *Journal of Industrial and Engineering Chemistry.*

The following divisions and sections met: Divisions of Agricultural and Food Chemistry, Biological Chemistry, Dye Chemistry, Fertilizer Chemistry, Industrial and Engineering Chemistry, Leather Chemistry, Chemistry of Medicinal Products, Organic Chemistry, Physical and Inorganic Chemistry, Rubber Chemistry, Sugar Chemistry, Water, Sewage and Sanitation Chemistry, and Sections of Cellulose Chemistry, Chemical Education, Gas and Fuel, History of Chemistry and Petroleum Chemistry. Full details of their meetings will be found in the October issue of the *Journal of Industrial and Engineering Chemistry.*

The divisions elected officers as follows:

Division of Agricultural and Food Chemistry: *Chairman,* H. A. Noyes; *vice-chairman,* R. H. Carr; *Secretary,* C. S. Brinton; *executive committee,* T. J. Bryan, Harper F. Zoller.

Division of Biological Chemistry: *Chairman,* J. S. Hughes; *secretary,* W. V. Bovie; *executive committee,* H. B. Lewis, *chairman,* A. W. Dox. D. B. Jones, A. R. Lamb, J. F. Lyman.

Division of Cellulose Chemistry: *Chairman,* G. J. Esselen, Jr.; *vice-chairman,* Louis E. Wise; *secretary-treasurer,* L. F. Hawley; *executive committee,* Harold Hibbert, J. F. Waite.

Division of Dye Chemistry: *Chairman,* W. J. Hale; *vice-chairman,* R. E. Rose; *secretary,* R. Norris Shreve; *executive committee,* L. A. Olney, L. F. Johnson.

Division of Fertilizer Chemistry: *Chairman,* F. B. Carpenter; *vice-chairman,* R. N. Brackett; *secretary,* H. C. Moore; *executive committee,* H. J. Wheeler, C. H. Jones, E. W. Magruder, A. J. Patten.

Division of Industrial and Engineering Chemistry: *Chairman,* D. R. Sperry; *vice-chairman,* W. A. Peters; *secretary,* E. M. Billings; *executive committee,* W. F. Hillebrand, Edward Mallinckrodt, Jr., F. M. DeBeers, A. Silverman, H. C. Moody, C. E. Coates.

Division of Leather Chemistry: *Chairman,* J. Arthur Wilson; *vice-chairman,* Charles S. Hollander; *secretary,* Arthur W. Thomas; *executive committee,* F. P. Veitch, C. R. McKee.

Division of Chemistry of Medicinal Products: *Chairman,* Edgar B. Carter; *secretary,* E. H. Volwiler; *executive committee,* Charles Caspari, Oliver Kamm.

Division of Organic Chemistry: *Chairman,* Frank C. Whitmore; *vice-chairman and secretary,* R. R. Renshaw.

Division of Petroleum Chemistry: *Chairman,* C. E. Delbridge; *vice-chairman,* R. R. Matthews; *secretary,* W. A. Gruse; *executive committee,* E. W. Dean, W. F. Faragher.

Division of Physical and Inorganic Chemistry: *Chairman,* Robert E. Wilson; *secretary,* Graham Edgar; *executive committee,* Farrington Daniels, J. H. Ellis, James Kendall, E. B. Millard, R. G. Van Name.

Division of Rubber Chemistry: *Chairman,* W. B. Wiegand; *vice-chairman,* E. B. Spear; *secretary,* Arnold H. Smith; *executive committee,* C. W. Bedford, D. F. Cranor, G. S. Whitby, H. L. Fisher, N. A. Shepard.

Division of Sugar Chemistry: *Chairman,* W. D. Horne; *vice-chairman,* F. W. Zerban; *secretary,* Frederick J. Bates; *executive committee,* W. B. Newkirk, C. E. Coates, C. A Browne, S. J. Osborn, H. S. Paine, H. E. Zitkowski.

Division of Water, Sewage and Sanitation Chemistry: *Chairman,* A. M. Buswell; *vice-chairman,* F. R. Georgia; *secretary,* W. W. Skinner; *executive committee,* W. R. Copeland, W. D. Collins.

DIVISION OF BIOLOGICAL CHEMISTRY

Howard B. Lewis, *chairman*

J. S. Hughes, *secretary*

The action of sodium soaps on trypsin. J. B. BROWN. The sodium soaps of the higher fatty acids have been found to destroy trypsin very rapidly. The amount of destruction of enzyme depends on the concentration of the soap and the time of exposure of enzyme to soap. The presence of protein substrate protects the enzyme and lessens the destruction. The satured and unsatured soaps are about equally destructive. Sodium soaps destroy the autolytic enzymes of dog liver and the ptyalin of human saliva. The action of soaps on these enzymes is much greater than can be accounted for as a p_H effect.

Metabolic disturbances in cats on a milk diet. GEORGE W. PUCHER and KARL F. CORI. A very interesting influence of milk on the alkalimetabolism of cats has been observed and studied

quantitatively. The striking features are summarized as follows: (1) Cats fed on meat and water excrete a urine normal for carnivorous animals. The total carbon dioxide content of the urine is very small and constant in value. (2) Cats when fed on milk excrete within 24-48 hours a urine which shows the following qualities: (*a*) Alkaline to brilliant yellow and even to phenolphthalein. (*b*) Substances which easily reduce Benedict's solution (5 minutes). (*c*) Huge amounts of bicarbonates (calculated from total CO_2 evolved). (*d*) Increase of the ammonia and the ammonia total nitrogen ratio. (3) Within 48 hours after the withdrawal of the milk the animals returned to normal. (4) Milk sugar is not responsible for these changes.

The effect of various methods of pasteurization on the vitamin C content of milk. J. S. HUGHES, N. E. OLSON and J. C. JENKINS.

The relationship between the inhibition point of fungicides and their concentration and their molecular weight. ERNEST BATEMAN. There is a definite relationship between the concentration of fungicides and the relative retardation in the growth of the fungus. This relationship can be expressed mathematically by the equation $\frac{R}{Cm^b} = K$ where Cm is the concentration in mols, b an exponent depending upon the structure of the compound, R the percentage retardation and K a constant. There is a definite relationship between the molecular weight of poisons in homologous series and their inhibition point. This relationship can be expressed by the equation $CM^d = K$ where C is the concentration at the killing point, M the molecular weight of the compound, d an exponent which is possibly governed by the organism and K a constant.

The proteins of wheat bran. D. BREESE JONES and C. E. F. GERSDORFF.

The nutritive value of the proteins of the palm kernel. A. J. FINKS and D. BREESE JONES.

Proteins from the cantaloupe seed (Cucumis melo); isolation of a crystalline globulin. D. BREESE JONES and C. E. F. GERSDORFF.

The physico-chemical properties of strong and weak flours. IV. The influence of the ash of flours upon the viscosity of flour-water suspensions. ROSE AIKEN GORTNER and PAUL F. SHARP. The viscosity of acidified flour-water suspensions is markedly influenced by the ash contained in the flour. The greater part of such ash may be removed by lixiviating the flour with water and using the leached residue for viscosity determinations. Such studies have led to the formula:

Log viscosity $= a + b$ (log concentration)

where a and b are constants, and the viscosity is the maximum viscosity obtainable with lactic acid. The numerical value of b is a measure of the colloidal properties of the gluten as influencing flour strength.

The physico-chemical properties of strong and weak flours. V. The identity of the gluten protein responsible for changes in hydration capacity as measured by viscosity. PAUL F. SHARP with ROSS A. GORTNER. The maximum viscosity of acidulated (lactic acid) flour-water suspensions from which the ash has been leached is but little altered by repeated lixivation continued until all, or practically all, of the gliadin has been removed. Glutenin is the only protein present in such a preparation in any considerable quantity, and it is the physical state of the glutenin which is responsible for changes in hydration capacity of wheat flour gluten.

The physico-chemical properties of strong and weak flours. VI. The physical state of the gluten as affecting loaf volume. PAUL F. SHARP with ROSS AIKEN GORTNER. Experiments by other workers have shown that an inferior loaf results when gliadin is removed from a flour by extraction with alcohol and the gliadin-free flour is dried, remilled and baked. This has been interpreted as indicating that the absence of gliadin is the determining factor of the poor baking results. We have found that essentially the same results may be obtained when flour is doughed up with 85 per cent. alcohol and the whole mass dried, remilled and baked. Here nothing was added to or taken from the flour. Nevertheless the flour "strength" is destroyed. The alcohol treatment has destroyed the colloidal properties of the glutenin and any agent which influences the colloidal properties of the glutenin will affect loaf volume.

The quantitative production of furfural from pentose material. N. C. PERVIER with ROSS AIKEN GORTNER. Furfural in theoretical yield may be distilled from pentose material by boiling with 12 per cent. HCl and at the same time passing a rapid current of steam through the solution.

The quantitative estimation of furfural by electrometric titration. N. C. PERVIER with ROSS AIKEN GORTNER. Furfural can be quantitatively titrated with bromine. We have employed a standard solution of potassium bromate, titrating in the presence of KI and 5 per cent. HCl, using

a galvanometer as an indicator. Two atoms of bromine are required for each molecule of furfural. Laevulnic acid and hexoses do not interfere in the estimation of pentose material by its conversion first into furfural and the subsequent titration.

Methods for the estimation of total solids and hydrophilic colloid content of expressed plant tissue fluids with certain phytochemical applications. ROSS AIKEN GORTNER, ROBERT NEWTON and WALTER F. HOFFMAN. The refractive index of a plant sap as measured by an Abbe refractometer may be used to measure quantitatively the total solids present in the sap. A measurement of "bound water" is used to estimate the hydrophilic colloid content. The depression of the freezing point of the original sap is obtained. Then a quantity of sucrose just sufficient to make a molar solution in the total water present is added and the depression of the freezing point is again obtained. The excess depression (over the theoretical 2,085 due to molar sucrose) is due to a part of the water being held by the hydrophilic colloids in such a manner as to be unavailable for the solution of sucrose.

The origin of the humin formed by the acid hydrolysis of proteins. VII. Hydrolysis in the presence of ketones. ROSS AIKEN GORTNER and EARL R. NORRIS. Ketones do not appreciably alter the nitrogen distribution of a protein as measured by Van Slyke's method. No evidence was obtained that ketones could be involved in humin formation. We believe, therefore, that humin formation is caused by the interaction of tryphophane and an aldehyde.

The tyrosine content of diaminized casein. H. B. LEWIS and RALPH C. CORLEY.

The influence of food on the excretion of endogenous uric acid in man. (By title.) H. B. LEWIS and RALPH C. CORLEY.

The synthesis and rate of elimination of hippuric acid in the organism of the rabbit. H. B. LEWIS and WENDELL H. GRIFFITH.

The analysis of the urine as a part of the physical examination of the college student. G. O. HIGLEY. This work was begun in 1915 because of the death of a college student from diabetes. Tests are made for sugar and for albumin, and in special cases for other pathological substances. Each year a considerable number of cases of nephritis are discovered, of which about two thirds show a previous history of an acute attack of that disease. When any pathological substance is detected a second and often a third sample of urine is tested, and the student is advised to consult a competent physician and to report his findings to the college physical examiner.

Further observations on the influence of vitamin B on the development of organs in Single Comb White Leghorn cockerels. ARTHUR J. SOUBA and R. ADAMS DUTCHER. Six hundred and nine chicks were hatched from eggs of pure line stock and placed on a normal chick ration. At the age of 76 days 150 normal cockerels were selected and divided in three groups, designated A, B and C. Group A received a normal ration with greens, Group B received an adequate synthetic diet and Group C received a synthetic diet, adequate in all particulars except vitamin B. After four weeks 25 birds in each group were killed and weights and measurements recorded on testes, heart, kidneys, spleen, pancreas, liver, thyroid and suprarenals. The remaining birds were allowed to continue until polyneuritis developed in Group C, at which time one bird from Groups A and B, including the polyneuritic bird, were killed. All data were treated biometrically. The absence of vitamin B produced significant losses in the weight of testes, heart, liver and kidneys. Differences in length of heart and spleen were also apparent.

Is nitrogen in gaseous form lost from germinating seed and young seedlings as an inherent function of their metabolic processes? JEHIEL DAVIDSON.

Influence of lysine upon the hydrolysis of starch by purified pancreatic amylase. H. C. SHERMAN and MARY L. CALDWELL. This is an extension of the work with arginine, histidine and tryptophane which was reported by the same authors last year. Lysine resembles histidine and tryptophane in not increasing the amyloclastic activity of pancreatic amylase while both lysine and tryptophane do increase its saccharogenic activity. These results are best interpreted in terms of the theory that the favorable influence of amino acids is attributable to their effect in checking the hydrolytic destruction of the enzyme in the aqueous dispersions in which it acts. The theoretical part of the paper does not lend itself to further condensation.

Influence of some organic compounds upon the hydrolysis of starch by salivary and pancreatic amylases. H. C. SHERMAN and NELLIE M. NAYLOR. In order to test the question whether the organic substances, which have been reported as favoring the activity of amylases, have a directly activating effect upon the enzyme by reason of their organic groupings, experiments

have been made with aniline, methyl and ethyl amines, benzoic benzamide, anthranilic acid and hippuric acid. These substances collectively contain the amino and carboxyl groups both singly and in different combinations but none of them showed any favorable influence upon the activity of salivary or pancreatic amylase when tested under what are now regarded as standard conditions for the activity of these enzymes. The results fail to furnish any support for the view that certain organic groupings as such activate amylolytic action. They make it much more probable that the favorable influence of α-amino acids upon amylases is to be attributed primarily if not entirely to their effect in preserving the enzyme from hydrolytic destruction.

Effect of amino acids in retarding the hydrolytic decomposition of an enzyme (pancreatic amylase). H. C. SHERMAN and FLORENCE WALKER. The extent of the deterioration of this enzyme when allowed to stand in solution for different lengths of time and at different temperatures with and without the addition of amino acid has been determined. The higher the temperature, up to the point at which coagulation begins, or the longer the time of heating, the more marked was the favorable effect of the added amino acid, thus confirming the view that the enzyme in its chemical composition either is a protein or contains protein as an essential constituent, and that the added amino acid exerts its favorable influence by checking the hydrolytic destruction of the enzyme.

Catalytic action of phosphates on the separate and simultaneous oxidation of glucose and butyric acid with peroxide. EDGAR J. WITZEMANN.

Energy expenditures by women during horizontal walking at different speeds. H. MONMOUTH SMITH and DORTHA B. BAILEY. Using the Douglas-Haldane method of measuring the gaseous exchange the energy expenditure of nine women was determined when standing and walking at speeds of 30, 60 and 90 meters a minute. The average standing expenditure was 0.606 calorie per minute per square meter of body surface computed by Du Bois height-weight chart. The total increase for the walking over the standing values showed an average expenditure for the nine subjects of 0.527, 0.489 and 0.552 gram-calorie per horizontal kilogrammeter for the speeds of 30, 60 and 90 meters per minute respectively. Seven out of the nine subjects showed a greater energy expenditure per horizontal kilogrammeter at 30 meters per minute than at 60. The menstrual period was apparently without effect on either the standing or walking metabolism.

The substitutions of glass electrodes for the hydrogen electrodes in electrometric titration. WALTER S. HUGHES.

Oxidation-reduction potentials and the stability of vitamin C. VICTOR K. LAMER. The difference in acidity is insufficient to account alone for the much greater stability of vitamin C to heat in the case of tomato and citrus fruit juices compared to that of cabbage juice where almost complete destruction occurs on boiling for one hour in the absence of air. The oxidation-reduction potentials of these juices, freshly expressed, were determined electrometrically in the absence of atmospheric oxygen. The potentials, when corrected for p_H, indicate that the stability of the vitamin depends upon the natural oxidizing or reducing condition of the juice as well as upon the opportunities that are afforded for atmospheric oxidation.

Flour strength as influenced by the addition of diastatic ferments. F. A. COLLATZ. The optimum activity for the diastase in malt flour with raw wheat starch as a substrate was found at p_H 4.26 and at a temperature of 65 degrees C. This activity was apparently constant over the period of digestion. The reducing sugars increased proportionately to the amount of diastase added. The viscosity of the digestion mixture (plus lactic acid) decreased with increasing amounts of added diastase and also with the time of digestion. This decrease is apparently not due to the salt effect. The gas producing capacity of strong flours is not increased by diastase, but with weak flours the reverse is the case.

Changes in hydrogen-ion concentration of fermenting dough. (By title). F. A. COLLATZ.

The synthesis of vitamins by molds. V. E. NELSON, ELLIS I. FULMER, V. G. HELLER and W. W. DUECKER. Yeast grown on medium F is about 60 per cent. as potent in vitamin B as Fleischmann's yeast; the above synthetic yeast will cure polyneuritis in pigeons. Air drying destroys about 30 per cent. of the vitamin B potency of yeast. *Aspergillus niger* and *Penicillium expansum* synthesize vitamin B when grown on Raulin's medium but do not synthesize vitamin A. The potency in vitamin B is about the same as that of our synthetic yeast. *Sclerotinea cinerea* shows vegetative growth on medium F but does not sporulate. The mycelia, according to incomplete data, shows no vitamin B. The work is being continued.

The use of kelp in the preparation of a diet

amendment for use in the treatment and prevention of deficiency diseases, particularly goiter. (By title). J. W. TURRENTINE.

SECTION OF CHEMICAL EDUCATION

Edgar F. Smith, *chairman*

Neil E. Gordon, *secretary*

Pandemic chemistry. WILDER D. BANCROFT. There is a great need for a course in chemistry which shall be intended for the man who wishes to learn something about the subject as a part of a general education; but who has no intention of going on with the subject. Such a course should cover the whole field of chemistry in an interesting way without wasting time on technical details. Cornell University is considering seriously starting such a course when the new chemical laboratory is finished. A general outline of the proposed course is given.

What chemistry shall be taught in high school and how shall it be correlated with college chemistry? LOUIS W. MATTERN. Stress is placed on the adaptability of chemistry in high schools to the development of certain habits and mental traits not only essential to the successful study of chemistry and other scientific subjects in colleges, but, as well, to the average citizen, at a time when such habits and mental traits are better obtained than in college. A discussion is made of the problems in the articulation between high school chemistry and college chemistry. A brief statement of content to cover less ground and to emphasize unity in high school chemistry is made with a view of the high school taking to college a greater thoroughness in fundamental principles, their relationships and the ability to apply them.

What chemistry shall be taught in the first year of college and how shall this be correlated with high school chemistry. HARRY N. HOLMES. High school chemistry is valuable as a training in scientific thinking but it should not be forced to prepare the student for second year college chemistry. First year college chemistry must consolidate what was learned before in an interpretive spirit and must introduce much new material. It should give much more attention to physical chemistry, organic chemistry, qualitative analysis —and be more quantitative in general. The research attitude of mind may be stimulated even in the first year. In dividing a large class into groups—the more elementary and the more advanced—the judgment of the teacher should be influenced by the records of the high schools from which students came and by a more or less formal quiz on high school chemistry.

What chemistry shall be taught in our professional schools? L. B. BROUGHTON. The chemical requirements for pre-medical students are cited as specified by the American Medical Association. The question is raised as to how the colleges of liberal arts and science should deal with this type of chemical training, with suggestions that some adaptations could be made.

Chemical education in dental schools. WORTLEY F. RUDD. The following points were covered in this paper: (1) Needs of freshmen students in chemistry in those dental schools requiring only high school graduation for matriculation. (2) Needs in those schools requiring one year of college work for matriculation. (3) The proper correlation of dental metallurgy and dental chemistry.

Chemical education in pharmacy schools. JOHN C. KRANTZ, JR. The purpose of the paper was to point out the objections to the teaching of strictly applied pharmaceutical chemistry in pharmacy schools, and also to show that the substitution of general college chemistry does not supply the needs of pharmacy students. The paper also describes an efficient and comprehensive method of correlating general and pharmaceutical chemistry in order to meet the demands of the pharmacy student.

What chemistry should be taught an agricultural student. C. W. STODDART. General inorganic and agricultural chemistry should be given to all agricultural students. Qualitative analysis should be a part of general chemistry. Organic chemistry and possibly quantitative analysis should be a part of agricultural chemistry, although the latter is not necessarily a part of the laboratory work of agricultural chemistry. For specialists in agricultural chemistry a separate course in organic chemistry is essential, and it ought to be "well rubbed in." They need also a course in quantitative analysis but combining theory with agricultural practice, not too distinct courses. Agricultural chemists must be well grounded in chemistry. But after all the teacher is the principal item in what chemistry should be taught to an agricultural student.

Qualitative analysis for engineering students. CHARLES W. CUNO. A short synopsis of the paper follows: (1) A discussion of the present methods of teaching qualitative analysis as a preliminary to other courses in chemistry. (2) A questioning of the wisdom of such a course for civil, mechanical and electrical engineers. (3) Suggestions: (*a*) For the modification of the course. (*b*) For a new course.

An experience with the general intelligence test in teaching freshmen chemistry. EDWARD BARTOW and JACOB CORNOG. A comparison of intelligence ratings as determined by a general intelligence test given at the beginning of the year with the final grades received by 948 students in freshmen chemistry gives a coefficient of correlation of .44 where complete causation would be represented by unity and no causation by zero. This indicates that intelligence as determined by this test is a partial but not predominant factor in determining final grades. The general intelligence test may be used in evaluating teaching performance of large numbers of teachers giving instruction in the same subject; for effecting economy in administration by early elimination of students of hopelessly low capacity; and for comparison of the mental potentialities of different groups of students. The general intelligence test does not afford a dependable basis for accurately forecasting a student's final grade in individual cases, except for students of extremely low intelligence.

The teaching of chemistry in negro private schools. B. T. HARVEY, JR. This paper presented some facts and conclusions derived from an investigation of the teaching of chemistry in negro private schools by means of personal observation, answers to a questionnaire and study of the catalogs of these institutions. After a preliminary survey of the scope of negro education and its effects, a statement of the aims of the courses in chemistry was made. Practice and results in these schools were checked by aims, finally suggestions were made for help in meeting difficulties involved in the teaching of chemistry in negro private schools.

Quantitative experiments in general chemistry. H. W. MOSELEY. In this paper the question was raised as to whether quantitative experiments usually assigned to students in general chemistry laboratory served their purpose; and as a result of this study a plan was suggested for the assignment of quantitative work to such students in a way to get results. Data were included.

The student's laboratory bench and his supplies. W. L. ESTABROOKE. The purpose of this paper was to trace the development of the student's laboratory bench during the past twenty-five years and the corresponding improvement in the method of handling his supplies. Two new student's desks were shown, one of which was a radical departure from that usually seen in chemical laboratories. The handling of student's chemicals was described by the writer in SCIENCE of May 30, 1919, under the heading "The Freas System" in honor of Thomas B. Freas of Columbia University, who has done more than most men in America to meet this problem. The exhibit consists of: (1) The chemicals used in one year of inorganic chemistry at the College of the City of New York. (2) The chemicals used in one year of qualitative analysis at the College of the City of New York. (3) The Fales' student's bench in inorganic chemistry, borrowed from Professors Freas and Fales of Columbia University, with a full equipment of apparatus and chemicals.

A system of individual reagents for courses in qualitative analysis. LOUIS J. CURTMAN. The author has designed two small wooden kits provided with shelves and capable of holding all the reagents, solids and solutions needed in qualitative analysis. These kits are of such dimensions that they can easily be locked up in the student's locker or cupboard. The shelves are specially constructed to permit the labels on the bottles to be plainly seen and to allow the bottles to be easily removed and replaced. Bottles of six different sizes are used depending upon the quantity of material needed. A set of solid salts and compounds, contained in a pasteboard box, is also provided.. From this small supply of chemicals the student weighs out the quantities needed for making his solutions. In the Freas system, which is in use at Columbia University, the student is provided with all the solutions he needs. In the author's method, the student is required to prepare all his solutions. The advantages of this system are: (1) The student becomes acquainted with the physical properties of the solid substances he used. (2) He is required to calculate, in each case, the quantity of salt needed to prepare a specified volume of a solution of definite normality. (3) By actually making up the solutions, he becomes familiar with the characteristic properties of such substances which require special treatment. This information he can obtain by no other method. The system outlined above has been successfully used at the College of the City of New York for the past five years. A paper describing this system in detail will shortly be published.

The teaching value of the electrochemical series of metals. R. A. BAKER. It is recommended that at the beginning of the course in general chemistry, each student be required to learn the names and symbols of the common metals, arranged in the order of the electrochemical series, together with the physical properties of the

metals as a group. For the remainder of the course the conventional order is preserved. As each non-metal is studied, its chemistry is projected on to this series of metals, with the result that no special consideration of the metals is required at the close. This arrangement causes any student who had studied chemistry before to adopt such a different point of view that he is fully occupied in applying the knowledge he already possesses. The exact order of the electrochemical series is an aid to the student in interpreting, correlating and directing his own experimentation. Use may be made of it in connection with the heats of formation of the metal oxides, hydroxides, nitrates, etc.; the replacements of metals by each other; the strength of bases, etc.

The schoolmaster and the teacher. E. G. MAHIN. The problems of the teacher of chemistry are briefly discussed and stress is laid upon correct personality of the teacher as an absolute prerequisite to successful teaching of science. Lack of interest on the part of the student frequently springs from lack of respect for the sincerity of the teacher. Science is the truth of nature and as such it must be respected. Before it sham and imposture must eventually give way. This conviction must be made a part of the student's training or he will never possess correct ideals of his life work.

The possibility of improvement in the contributions colleges make to industries. EDWARD ELLERY.

Proper methods of conducting undergraduate research. WILLIAM A. NOYES. Two purposes should be constantly in the mind of the teacher who directs research work of undergraduates. First, the student should be trained in the use of chemical literature. He should learn how to find for himself the results of previous work on the problem he is studying. Second, he should be taught to develop personal initiative in attacking a problem. He should never be considered merely an agent to carry out an experiment which the teacher wishes to be performed.

The best college course for the chemist. ROBERT E. ROSE. What the industries most desire is a well balanced education in those who enter their research laboratories. Chemistry, as it is taught at present, is sub-divided much too rigidly, and the several parts are not treated in the proper perspective. A course is outlined which would give a general survey of the whole field of chemistry during the first year. This would be valuable to those specializing in chemistry as well as to students desiring the course for its cultural value. The essentials in science and in the correlated subjects for the four year course are discussed, and the content of the courses outlined. The suggestions call for a totally different treatment of all our science classes.

The education of the chemist. J. B. GARNER. The subject is one regarding which there is a diversity of opinion varying from that of the dreamy academician to that of the true practicalist. Both the unreasonable expectation of the classical pedant to justify his idea of culture and the behest of the industrialist to meet immediate technical demands sacrifice the ultimate welfare of the chemist in training. Experience has shown that personality, mentality and professional training are the essential elements in the make-up of a chemist. Personality is one of the most valuable assets of the chemist. Personal qualities protrude more in concerted research than in any other human endeavor. Personality is made up of the qualities of resourcefulness, creativeness, initiative, pertinacity, cheerfulness, loyalty, honesty and courtesy. Mentality is the mental power, or the right kind of brains for successful issue in matters chemical. Mentality comprehends consciousness, thought, opinion, memory, reason, decision, purpose, common sense and tact. The real character of the chemist is in his purpose and the strength of his character is in the decision and firmness of this purpose. Personality and mentality energize and give direction to professional training. The test of the adequacy of professional training is the use of this training. It must be sufficient when combined with personality and mentality to supply that which is needed as one's life program. Men must be trained by colleges, technical schools and universities to adapt themselves with certainty to the new economic conditions. Therefore, courses of study must be rearranged as to their content, and curricula must be formulated. The subject matter of all courses must be such that contact with real life, actual conditions, and needs, is made. Education is for life and for service. The general scope of training must be as extensive, and the time required for its completion as great, as that for the profession of medicine. Chemists must be industry builders and developers of national natural resources. A proposed outline of courses for the professional training of the chemist will be offered. As far as professional training is concerned, the shortcomings of the chemist are largely English, chemical literature, German, French, quantitative analyses and general engineering.

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