was found to be best in all cases, sodium hydroxide gave the best results with the majority of waters. Sodium fluoride is to be preferred for waters containing calcium sulphate and chloride, while barium hydroxide is most serviceable in the treatment of acid mine waters.

The Engineering Chemistry of Boiler Waters. By HENRY LEFFMANN. *Am. Gas Light J.*, 69, 416–418.—This paper is a discussion of the causes of corrosion and scale-forming in boilers and of various methods for preventing this.

A. H. GILL, REVIEWER.

Chemical Analysis of Wyoming Petroleum. By E. E. SLOSSON. *School of Mines, Univ. Wyo., Bull.* 3, 26–31.—The three petroleums examined are all very heavy, having a specific gravity of 0.915–0.935 and a flash of 123°–134° C. No considerable quantity of oil will volatilize under 270° C., at which temperature it cracks, giving light and heavy products. On redistillation the oils break up still further into undesirable mixtures. The crude petroleum is a better lubricant than any products obtained from it. The three samples contained 0.3, 0.1 per cent. and no sulphur, respectively.

E. H. RICHARDS, REVIEWER.

The Quality of the Boiler Water Supply of a Portion of Northern Illinois. By JAMES A. CARNEY. *Trans. Am. Inst. Min. Eng.*, 27, 130–139.—This paper is a contribution to the solution of the problem of the best feed water for locomotive boilers. Thirty-eight samples were taken from the possible sources of supply along the C. B. & Q. R. R. between Chicago and Burlington, a distance of about 200 miles. The average of the three classes of water is given in grains per U. S. gallon. The total solids in the surface waters were 16.62, in the shallow wells 37.99, and in the deep waters 72.11 grains, while the incrusting solids were 14.88, 35.09, and 23.30, respectively, for the three classes of waters. Surface waters are recommended wherever practicable, as containing not only less incrusting solids but less sodium salts, which, if present in any quantity, give rise to "foaming."

BIOLOGICAL CHEMISTRY.

A. G. WOODMAN, REVIEWER.

Asterionella: Its Biology, Its Chemistry, and Its Effect on Water Supplies. By GEORGE C. WHIPPLE AND D. D. JACKSON. *J. N. E. Water Works Assoc.*, 14, 1–23.—Having been enabled to collect Asterionella quite pure and in considerable

quantities, the authors have made a complete analysis of it. The most striking feature of the analytical results is the high percentage of mineral matter, amounting to 57.52 per cent. of the dry weight of the organism ; 49.48 per cent. of the dry weight is silica, which forms the cell wall. The authors have calculated the amount of certain materials, such as silica and manganese, which a water must contain in order to admit of the growth of the organism, basing their calculation on the weight of an Asterionella cell. In order to check the growth of the organism, it is recommended to limit the supply of available food material, especially of silica, manganese, iron, and nitrates.

The Amount of Humus in Soils and the Percentage of Nitrogen in the Humus, as Affected by Applications of Air-slaked Lime and Certain Other Substances. By H. J. Wheeler, C. L. Sargent, and B. L. Hartwell. *J. Am. Chem. Soc.*, **21**, 1032–1037.—The authors have carried out experiments on the effect of various fertilizing materials on the amount of humus in soils. They find that, without exception, the addition of air-slaked lime or gypsum lowers the total amount of humus, but that the percentage of nitrogen in the humus is increased. When sodium nitrate was applied without the use of lime, the percentage of humus and of nitrogen reached a maximum.

A Contribution to the Chemistry of Butter-fat. II. The Chemical Composition of Butter-fat. III. The Chemistry of Rancidity in Butter-fat. By C. A. Browne, Jr. *J. Am. Chem. Soc.*, **21**, 807–827 ; 975–994.—II. By methods involving fractional precipitation of the insoluble acids from alcohol, and solution of the soluble acids in water at different temperatures, the author has made a complete analysis of butter-fat with the following results :

Acid.	Per cent. of acid.	Per cent. of triglycerides.
Dioxystearic	1.00	1.04
Oleic	32.50	33.95
Stearic	1.83	1.91
Palmitic	38.61	40.51
Myristic	9.89	10.44
Lauric	2.57	2.73
Capric	0.32	0.34
Caprylic	0.49	0.53
Caproic	2.09	2.32
Butyric	5.45	6.23
Total	94.75	100.00

III. The three factors most active in the production of rancidity in fats are openness to air, exposure to light, and degree of warmth. One of the chief changes produced consists in the decomposition of the oleic acid, which is partly broken down

into compounds having an aldehydic nature, as well as into lower oxy-acids. Another marked effect of rancidity upon fats is in the marked decrease in the heat of combustion.

Notes on Testing Soils for Application of Commercial Fertilizers. By H. A. Weber. *J. Am. Chem. Soc.*, **21**, 1095-1099.—Small samples of soils of about five kilograms each are mixed with various fertilizers. Several seeds of different kinds of grain are added to each sample, and the differences in the growth and condition of the plants noted from time to time. From the results of this simple test the needs of the particular soil can be readily learned.

Studies on Bread and Bread-making. By Harry Snyder and L. A. Voorhees. *U. S. Dept. Agr., Expt. Sta. Bull.* 67, 1-51.—Among the more important changes which have been found to take place in baking bread the following may be noted: (1) The starch undergoes both physical and chemical changes. From 3 to 4 per cent. of soluble carbohydrates are found in bread, showing that less than eight per cent. of the total starch is rendered soluble. (2) The amount of water-soluble proteid which is formed depends upon the degree of acidity of the dough. (3) The physical properties of bread are determined largely by the expansive power of the gluten of the flour. (4) At high temperatures there is a partial volatilization of the vegetable fat in bread, especially when escaping water vapor is present; and, furthermore, an oxidation of residual organic matter takes place. When an animal fat is added there seems to be an occlusion of fat, probably due to the formation of dextrin.

A Description of Some Chinese Vegetable Food Materials and Their Nutritive and Economic Value. By Walter C. Blasdale. *U. S. Dept. Agr., Expt. Sta. Bull.* 68, 1-48.—A number of species of Chinese vegetables, as found in the San Francisco market, amounting to about 50 varieties in all, were collected, identified botanically, and in most cases submitted to chemical analysis. The analytical methods employed were, in the main, the official ones. The results which are given add much to our knowledge of the chemical composition of Chinese food materials.

Commercial Fertilizers. *N. J. Agr. Exp. Sta., Bull.* 139, 1-59; *Me. Agr. Expt. Sta., Bull.* 53, 57-70; *N. Y. Agr. Expt. Sta., Bull.* 160, 63-151.

On Nitrites as a Product of Combustion. By Edward W. Axson. *Tech. Quart.*, **12**, 219-225.—The author has made quantitative experiments on the amount of nitrites formed dur-

ing combustion and in breathing, in order to determine the best conditions for absorption and the comparative amounts of nitrite obtained from various sources. A test was also made of the physiological effects of breathing air high in nitrites.

The Action of Hepatic, Renal, and Other Cells on Phenol and Indol, under Normal and Pathological Conditions. By C. A. Herter and A. J. Wakeman. *J. Expt. Medicine*, 4, 307–326. —In this study of the natural defenses of the organism against injury through chemical agencies indol and phenol were selected for use, because they are normal products of proteid cleavage in the intestine, and are often found in abnormal quantities in the course of digestive derangement. In the "contact" method of study the organs of healthy rabbits were chopped into fine bits, and a definite weight brought into contact with weak solutions of phenol and indol. After some time the mixture was distilled, and the presence of phenol and indol shown in the distillate by color reactions. In the "infusion" method intravenous injections were made of solutions of phenol and indol. In general, the order of activity of the cells was found to be liver, kidney, muscle, brain, and blood. Only in the case of the liver was it possible to get satisfactory results under pathological conditions. The prolonged action of chloroform and of ether decreased the power of the liver cells in the conversion of phenol and indol. Alcohol was found to be without appreciable effect. From these and further experiments with a number of poisons the conclusion is drawn that no pathological conditions which can be induced in the liver during life are capable of destroying or limiting the activity of its cells in causing the conversion of phenol and indol.

The Relation of Dextrose to the Production of Toxin in Bouillon Cultures of the Diphtheria Bacillus. By Theobald Smith. *J. Expt. Medicine*, 4, 373–397.—The author has found that contrary to the usual ideas dextrose is not in itself inimical to toxin production, but that a certain amount of it is necessary for abundant toxin accumulation. If added in quantities not greater than 0.2 per cent. to peptone bouillon freed from fermentable acid-producing substances, it leads to the maximum accumulation of toxin by utilizing the available peptone to the best advantage. The lesser yield of toxin in ordinary unfermented peptone bouillon containing muscle sugar may be explained by the assumption that the acid products of muscle sugar are different from those of dextrose and non-utilizable, or else that the bouillon contains unknown inhibitory substances removed during fermentation.

The Origin of Fat from Protein in the So-called Fatty Metamorpohsis of Phosphorus Poisoning. By Alonzo

ENGLEBERT TAYLOR. *J. Expt. Medicine*, 4, 399–407.—In this study of fatty degeneration a certain number of frogs, all of the same sex, of approximately the same weight, selected at the same time, and kept awake and without food for the same period, were divided into equal groups. One-half of the number were poisoned with phosphorus, the other half formed a control group. The dried residue of the poisoned frogs weighed 16.5 per cent. less than that of the control group; it contained 18.45 per cent. less protein, 22.64 per cent. less fat, and about 13.3 per cent. less glycogen. While these results differ from those of other investigators, it is felt that the more rigid conditions obtaining in the present study render the conclusion that no fat is produced from protein the more probable one.

Experiments on the Conservation of Energy in the Human Body. BY W. O. ATWATER AND E. B. ROSA. *U. S. Dept. Agr., Expt. Sta. Bull.* 63, 74–94; *Phys. Rev.*, 9, 238–251. —The authors describe one or two of the earlier experiments made on men with their modified form of respiration calorimeter. They find a fairly close correspondence between the estimated income and the measured outgo of energy, the difference being practically less than the limits of experimental error. The experiments, in general, demonstrate the applicability of the law of the conservation of energy to the human organism.

Experiments on the Metabolism of Matter and Energy in the Human Body. BY W. O. ATWATER AND F. G. BENEDICT. *U. S. Dept. Agr., Expt. Sta., Bull.* 69, 1–112.—This bulletin contains detailed descriptions of six experiments made on the metabolism of matter and energy in human subjects by the use of a respiration calorimeter. Various improvements in the methods of sampling the food materials used and in the methods of examination of the waste materials are described. The accuracy of the apparatus and of the methods for the determination of carbon dioxide, water, and heat was tested with an electric current, by which known amounts of heat were produced in the chamber of the apparatus, and by burning alcohol in the chamber, thus producing known amounts of carbon dioxide, water, and heat.

Tho Influence of the Presence of Pure Metals upon Plants. BY EDWIN B. COPELAND AND LOUIS KAHLENBERG. *Trans. Wis. Acad. Sciences, Arts, and Letters*, 22, 454–474.—Nageli concluded from a study of this subject that pure water is harmless, but that various metals in infinitesimal quantities are deadly. He was convinced that the injury done to the plant was of a different nature from ordinary poisoning and proposed for the new phenomenon the name of "Oligodynamic effects." The

authors do not accept this explanation, but consider the result to be due to the presence of metallic salts formed by the action of the oxygen or the carbonic acid of the water or of the water itself. In studying this question, a number of experiments have been carried out in glass beakers coated with paraffin to remove the disturbing influence of the glass. The metals were used where possible, in the form of foil, in order to expose a large surface; the seedlings used were average plants selected from a large number. At the beginning of the experiment a mark was made 10 mm. from the apex of the root and the excess in length of these spaces over the original was noted daily. The condition of the metals was also observed at the end of the experiment. The injury to the plant was found to depend largely upon two factors; namely, on the tendency of the metal to go into solution as a chemical compound or salt, and on the specific toxicity of the metal when in solution in the form of such salts. In regard to the first factor, it was found that the relative power of those metals in causing injury was closely related to the magnitude of their solution tension; concerning the second, it was found that in general those metals poison plants when present in water whose salts are already known to be toxic.

On the Excretion of Kynurenic Acid. By Lafayette B. Mendel and Holmes C. Jackson. *Am. J. Physiology*, **2**, 1–28.—Kynurenic acid is, with only one exception, the only quinoline compound discovered in connection with the animal body. The object of the authors was to study the conditions which determine and modify the production and excretion of kynurenic acid. Experiments were made on dogs which were fed on definite quantities of food, the excreted nitrogen and kynurenic acid being determined by analysis. The results obtained indicate that kynurenic acid excretion accompanies accelerated proteid decomposition and is directly dependent on the proteid katabolism. Similar results are given by the ingestion of both animal and vegetable proteids as well as proteoses, but gelatin, like the carbohydrates, does not give rise to kynurenic acid in metabolism. Under the influence of foods lacking in protein the kynurenic acid excretion is greatly diminished or absent. Kynurenic acid has not been found in the urine of any animal other than the dog.

The Origin of Fibrinogen. By Albert Mathews. *Am. J. Physiology*, 3, 53–85.—It is shown by a number of experiments that after defibrination of the blood of cats the fibrinogen is rapidly re-formed, the amount becoming normal again in two or three days. This re-formation of the fibrinogen takes place in the absence of the spleen, pancreas, kidneys, reproductive organs or brain, but does not take place to any appreciable extent if the small and large

intestines be removed. The paraglobulin of the blood is not converted into fibrinogen outside the body nor by the skin or more remote tissues. The blood of the inferior vena cava both above and below the kidneys is poorer in fibrinogen than is the carotid blood, while the blood of the mesenteric vein is constantly somewhat richer in fibrinogen than is the arterial blood. Fibrinogen is not derived directly from the proteid constituents of food, since it is readily re-formed after six to ten days' fasting ; the fibrinogen content of the blood does not diminish during fasting. If, however, leucocytosis be prolonged for several days the fibrinogen content of the blood increases. These various observations point to the decomposing leucocytes of the blood, and chiefly those of the intestinal area, as being the source of the fibrinogen of the blood, although it is hardly possible as yet to regard the evidence as conclusive.

On Metabolism during a Combination of Phosphorus Poisoning and Phlorhizon Diabetes. By W. E. Ray, T. S. McDermott, and Graham Lusk. *Am. J. Physiology*, 3, 139–155. —In dogs diabetic with phlorhizin phosphorus poisoning does not cause any noteworthy increase in proteid metabolism or change the sugar excretion ; in dogs poisoned with phosphorus, however, the administration of phlorhizin brings about not only the usual preliminary sweeping out of the body sugars and the establishment of the customary ratio between urinary dextrose and nitrogen, but also causes an increase in proteid metabolism. The authors consider the high proteid decomposition in phlorhizin diabetes to be due to the non-burning of the carbohydrate-like radical of the proteid molecule. In phosphorus poisoning the proteid decomposition is due to the fatty degeneration of the carbohydrate radical. The fatty infiltration noticed in post-mortem examinations is due to the action of pathologically hungry cells which attract the fat to themselves in greater quantities than can be utilized.

A Preliminary Note on the Fractional Precipitation of the Globulin and Albumin of Normal Horse's Serum and Diphtheric Serum, and the Antitoxic Strength of the Precipitates. By James P. Atkinson. *J. Expt. Medicine*, 4, 649–650.—In this preliminary paper attention is called to the compounds obtained from the globulin of horse's serum by fractional precipitation with sodium chloride at temperatures between room temperature and 72° C. The same phenomenon is noticed in the serum itself after removal of the globulin, precipitation beginning at 56° C. and being complete at 81°. Each fraction of the antitoxic globulin is found to possess antitoxic power, while the final filtrate is free from antitoxin.

Observations on the Nitrogenous Metabolism of the Cat, Especially on the Excretion of Uric Acid and Allantoin. By LAFAYETTE B. MENDEL AND ERNEST W. BROWN. *Am. J. Physiology*, 3, 261–270.—The results of a number of experiments show that kynurenic acid is not excreted by the cat, even under conditions of increased proteid metabolism. An increase, however, in the excretion of uric acid is brought about by feeding the animals with thymus and pancreas tissue, as is also the case with man and with the dog. The excretion of allantoin is noticeable after the ingestion of thymus and pancreas tissue or uric acid, but preliminary experiments have failed to show the production of allantoin after the administration of hydrazine sulphate.

On the Occurrence of Iodine in the Thymus and Thyroid Glands. By LAFAYETTE B. MENDEL. *Am. J. Physiology*, 3, 285–290.—The author concludes that there is no evidence to show that the carefully isolated thymus of man or animals contains iodine, and considers the traces found by other observers to be due to adherent thyroidal tissue. The results of several observations present confirmatory evidence of the absence of iodine in the thyroid glands of newly-born children. The accessory thyroids in man sometimes contain more iodine than the thyroids proper.

On the Chemical Reaction of the Intestinal Contents to Various Indicators, and on the Nature of the Contents Escaping from a Fistula Immediately above the Ileo-caecal Valve. By B. MOORE AND T. J. BERGIN. *Am. J. Physiology*, 3, 316–325.—The alkaline reaction of the intestine to methyl orange, lacmoid, and litmus, shows the absence of hydrochloric acid, and of all stronger organic acids as acetic, lactic, or butyric, which would be formed in the bacterial decomposition of carbohydrates or fats. The acid reaction of the intestine to phenolphthalein the authors consider due to the excess of dissolved carbonic acid. The chemical nature of the substance escaping from the fistula indicates that the absorption of foodstuffs, in the dog at least, can be practically completed in the small intestine. A proteolytic enzyme, active in alkaline solution, and a diastatic ferment, also active in alkaline solution, are found in the dog's intestine at this level.

E. H. RICHARDS, REVIEWER.

Rivers Pollution and Water Supplies. By HERBERT E. SMITH. *Conn. State Board of Health, Ann. Rep., 1898*, 266–395.—The water supplies of twenty towns in the state have been examined monthly for periods varying from three months to one year. The Naugatuck and Quinnipiac rivers have been exam-

ined during one year at four places each. The results add valuable data for New England water-sheds. There are also given the results of a year's examination of the sewage and effluent from Meriden.

An Investigation of the Action of Water upon Lead, Tin, and Zinc. By H. W. Clark. *Mass. State Board of Health, Ann. Rep.*, **30**, 541–585.—Eight hundred samples of water from 63 towns in the state were examined. The water from 24 towns showed less than 0.05 parts of lead per 100,000; from 29 towns there was over 0.1 part, and of these 10 samples gave from 0.40 to 8.55, results quite justifying the extensive examination. The method finally used is as follows: 3.5 liters are concentrated to 25–30 cc., ammonium chloride and ammonia are added, and then hydrogen sulphide water. After standing, the hydrogen sulphide is expelled by boiling, and the separated sulphides of iron, lead, copper, and zinc, together with any suspended organic matter, are filtered off, the soluble coloring-matter remaining in the filtrate. The residue is heated with HNO_3 (1 part acid, sp. gr. 1.2, to 5 parts water), the solution filtered, concentrated to 10–15 cc., treated with 5 cc. strong H_2SO_4, and heated until fumes of the latter come off. If the sample contained less than 0.025 part per 100,000 of iron, it is removed by ammonia and the lead determined in the filtrate. If, however, there is a larger amount, the lead sulphate is washed with 50 per cent. alcohol until free from iron, and then dissolved in ammonium acetate and the depth of color, given by freshly prepared hydrogen sulphide, compared with that of standards. Copper rarely interferes, and zinc is easily separated and determined.

Report on the Investigations into the Purification of the Ohio River Water at Cincinnati. By George W. Fuller. *Cincinnati, 1899*, 1–620.—In addition to many valuable data on water purification from the mechanical and bacteriological point of view, this report contains the results of daily examinations of the Ohio River water over a period of two months, as compared with the averages of the previous year, and also analyses of the various effluents. There is, in addition, an account of experiments with lime as a coagulant for suspended clay, combined with subsequent treatment by carbon dioxide to remove the excess of lime.