

antagonizing salt must be of such a nature that its contact (as metal) with passive iron promotes passivity rather than activity; thus it is well known that contact of passive iron with copper, lead and other baser metals causes activation, while contact with mercury and the nobler metals has no such effect and indeed promotes passivity. Hence any metallic particles of the former class which may be deposited on the iron surface serve as activating centers (*i. e.*, are anodic relatively to passive iron), while those of the latter class have a reverse or passivating influence. The ability of any cation to prevent activation thus depends upon the electrical potential of the metal in relation to that of the passive iron surface. In other words, the passivating effect is a direct function of the oxidizing potential of the ion in question, *i. e.*, the readiness with which it parts with its positive charge (or receives electrons).

As already shown, the activating effect of the NaNO_3 solution is equally well prevented by the addition of small quantities of salts with strongly oxidizing anions, like $\text{K}_2\text{Cr}_2\text{O}_7$ or KMnO_4 ; oxidizing non-electrolytes like H_2O_2 and OsO_4 have a similar influence. Ionic antagonism is thus not a function of the sign of the ionic charge, but of the special chemical—more specifically oxidizing—properties of the ion. Non-electrolytes with similar chemical properties are equally effective. All of these phenomena have parallels in the behavior of living systems.

Pure solutions of AgNO_3 , $\text{Hg}(\text{NO}_3)_2$, $\text{K}_2\text{Cr}_2\text{O}_7$ and KMnO_4 both preserve passivity and have a rapid passivating action on active iron. An exposure of two or three seconds to $m/20$ AgNO_3 or $\text{Hg}(\text{NO}_3)_2$ is sufficient to confer passivity upon an active wire. The velocity of the passivation-process is high; in a series of experiments with solutions of AgNO_3 ($m/10$, $m/20$, $m/40$, $m/80$, $m/160$) it was found that even in the $m/160$ solution an exposure of three seconds was usually sufficient for passivation. Saturated KMnO_4 passivates with exposures of one second or less; $\text{K}_2\text{Cr}_2\text{O}_7$ is somewhat slower in its action.

The essential results of experiments with

surface-active organic compounds (anæsthetics) can be summarized briefly. $m/20$ CuSO_4 was used, containing in solution the compound under examination; the rate of activation was compared with that observed in the pure $m/20$ CuSO_4 . In general such compounds, unless of a definitely oxidizing chemical character (*e. g.*, nitro compounds or nitrate esters), exhibited little or no effect in either retarding or accelerating activation. The higher aliphatic alcohols, however (n-hexyl, n-heptyl, n-octyl, capryl), had a moderate retarding influence in saturated solution, an effect probably dependent on the viscosity of the adsorbed layer and the lowered electrical conductivity; little effect was found with the lower members of the series. Chloroform, ethyl ether, carbon tetrachloride, ethyl and phenyl urethanes, fatty acid esters (ethyl acetate, propionate and butyrate), chlorotone, paraldehyde, chloral hydrate, benzol, naphthalene, phenanthrene, all showed little or no retarding action. On the other hand, ethyl nitrate had a well marked antagonistic effect, in one case prolonging passivity for more than twenty-four hours; nitromethane and acetonitrile also caused distinct retardation. Parallels with the general pharmacological action of the above compounds are thus not apparent in these experiments, but the existence of such parallels is perhaps hardly to be expected. In the living cell the characteristic action of these compounds appears to depend largely upon solution in the organic solvents of the protoplasm, especially the lipoids; the stability of the protoplasmic film is correspondingly altered, being increased at the anæsthetizing concentrations of the compounds. In the metal no such process of solution can occur, and whatever influence is exerted appears to depend upon the physical properties of the adsorbed layer or upon the direct chemical action of the compound upon the metal.

RALPH S. LILLIE

PHILADELPHIA MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE general description of the meeting held September 2 to 6, 1919, has already been printed

in SCIENCE, for September 19. The following is a list of the papers with abstracts in so far as they have been obtained:

GENERAL MEETING

Some problems and methods in agricultural research: H. J. WHEELER.

Some physiological effects produced by radiating definite regions within a single cell: W. V. BOVIE.

Stream pollution and its relation to the chemical industries: EARLE B. PHELPS. Published in full in *Jour. Ind. and Eng. Chem.*, 10 (1919), 928. The relation of stream pollution to the chemical industries is two-fold. Many industries require water supplies of good quality, and most of them produce liquid wastes which, if discharged without treatment into the water courses, tend to pollute those waters. With the growth of industry, and the increasing joint use of streams for the purposes of water supply and waste disposal conflicts of interest are bound to arise.

In most states this matter comes under the administrative activity of the public health officials, who likewise initiate or assist in framing the laws. Manufacturing interests have in the past exerted merely obstructive influence.

Stream pollution and its control involve problems of engineering, chemistry, biology and economics. The first aim is the fixing of standards of permissible pollution which will develop the maximum advantageous use of the streams.

The subject of treatment presents many interesting chemical problems, and its study frequently leads to important recoveries of by-products.

The subject of stream pollution and its control is broader than its legal and remedial phases; its public-health interests or its manufacturing interests; its broader than state jurisdictions. It is a part of the problem of the maximum utilization and development of our waterways. As such it is essentially a Federal problem, calling for extensive investigation and uniform treatment. Its importance should be fully recognized in the creation of any such federal commission as the Interstate Waterways Commission which has recently been suggested.

The building of atoms and the periodic systems: W. D. HARKINS. (To be printed in SCIENCE.)

The chemical laboratory as a publicity factor: ROBERT P. FISCHER. See *Jour. Ind. and Eng. Chem.*, 10 (1919), 929.

DIVISION OF AGRICULTURAL AND FOOD CHEMISTRY
W. D. Richardson, *Chairman*.

T. J. Bryan, *Secretary*.

What was the diet of aboriginal man? W. D. RICHARDSON.

On the constitution of butterfat: W. D. RICHARDSON.

Some experiments on simple dietaries: W. D. RICHARDSON.

Influence of segregation upon the composition of sugar products: C. A. BROWNE. The author after a brief mention of the uneven distribution of the constituents of different sugar products, such as honey, sirup, sugars, jelly, etc., produced by gravity, capillarity, evaporation and other causes, cites the specific instance of low grade molasses. Top and bottom portions of Cuban molasses, which gave no visible indications of deposits, showed from 2.50 per cent. to nearly 4 per cent. more ash and from 0.25 per cent. to 1.40 per cent. more organic non-sugars in the bottom layers. Similar but less pronounced differences were observed in case of refinery molasses. As a result of the settling out of insoluble salts and gums the top portions of unmixed molasses may be expected to contain more water, sucrose and invert sugar than the bottom portions.

The hygroscopic capacity of certain food constituents: C. A. BROWNE. The moisture-absorbing capacity of levulose agar, gelatin, peptone, bread, cellulose and sucrose are given for different conditions of atmospheric humidity. For ordinary conditions the power of the substances to absorb moisture decreases in the order named. As regards influence of season food products have the least moisture in February and the highest moisture in July and August. The ratio of moisture content to humidity and the influence of lag (due to time of adjustment between surface and interior moisture) are discussed. The rates of absorption for the different substances under constant humidity are given, also a few practical bearings which the results have upon commercial and analytical problems.

The relative importance of some coloring matters in sugar cane juices and syrups: F. W. ZERBAN.

Nutrition experiments with low-cost protein diets with reference to the utilization of peanut and soy bean flours: CARL O. JOHNS, A. J. FINKS and MABEL S. PAUL.

The amount and distribution of iron in the corn plant: G. N. HOFFER, R. H. CARR and I. L. BALDWIN.

Chemical changes in cranberries during storage: FRED. W. MORSE. There are small but positive differences in the percentages of sugar and acid contained in different varieties of cranberries. The maximum of sugar is present soon after picking. During storage the sugar slowly diminishes as the berry makes use of it in maintaining its life processes. The rate of change is much accelerated by a rise in temperature and is most pronounced when the fruit is kept in tight, unventilated packages. Acid remains as a rule unchanged.

Respiration of cranberries: FRED W. MORSE. A simple method of estimating the rate of chemical changes in fruit at a given temperature, is to determine the amount of CO₂ exhaled by a kilogram of the fruit in an hour. The CO₂ is produced by the oxidation of some of the soluble carbonaceous matter in the fruit's cells, hence the rate of metabolism may be closely estimated. The experiments showed that cranberries exhaled twice as much CO₂ at 10° C. as at 1° and that the rate doubled again at 20°. The nearer the freezing-point, fruits are held before they are consumed, the more nearly will their quality remain like freshly picked fruit. A week at summer temperature will be as destructive to quality as a month in cold storage.

The cause of deterioration and spoiling of corn and corn meal: J. S. MCHARGUE.

The water soluble manganese of soils: W. O. ROBINSON, R. F. GARDINER and R. S. HOLMES. The results obtained by frequently shaking 24 samples of soil with distilled water for eight days are given in this paper.

The following deductions are drawn from the data: (1) One hundredth to .1 of the total manganese of soils is soluble in water. (2) Carbon dioxide greatly increases the solubility of the manganese. (3) Surface soils contain much more soluble manganese than subsoils, the difference is greater the finer the texture of the soil. (4) The amount of MnO in soil extracts varies from 0-24 parts per million and is large enough to affect the bacteriological flora and probably has a more direct influence on plant growth.

The composition of ultra clay from certain soils: W. O. ROBINSON. By the term "ultra clay" is meant that body which remains in nearly permanent suspension when the soil is treated with pure water. It has no organized structure and behaves as any colloid. It is essentially an extremely finely divided hydrous aluminum silicate, with some of

the aluminum replaced by iron. Hydrated oxides of aluminum, iron, titanium, silicon and manganese (probably) are also present. The phosphoric acid and potash of ultra clays is higher than the soil from which they were obtained. Organic matter is an ever present constituent and it is probable that it plays an important part in deflocculating the suspension.

Composition of soil extracts: M. S. ANDERSON and W. H. FAY. The salts deposited on the evaporation of the water extract of soils are much more complex in character than is indicated by a simple statement of the ions existing in solution. There is a marked general similarity between the salts obtained on evaporation of water extracts of soils and those obtained by both natural and artificial evaporation of sea-water. No salt can be expected to furnish all the salts occurring in natural deposits of saline material because these represent crystallization from a composite extract. Under ordinary soil conditions these complex salts are probably always in solution in the soil moisture.

Melezitose in honey: EDGAR T. WHERRY. Melezitose is a rare sugar, a trisaccharide, which has heretofore been but little known. Its name is from melez, the French name for the larch tree, it having been discovered in a honey dew on the European larch. It also occurs in manna, a sugary incrustation, on a leguminous tree in Persia and adjoining countries. Its occurrence in a similar material found on the Douglas fir in British Columbia has been recently described by Hudson and Sherwood.¹ While the latter occurrence was under investigation, some honey received from central Pennsylvania was found to be nearly solid from the crystallization of the same sugar; and Dr. C. S. Hudson asked the writer to visit the regions where this honey was produced, and endeavor to ascertain the origin of the melezitose. After considerable study, the following origin of this substance was worked out: The scrub pine tree, and rarely other species of pine, are subject to attack by a plant louse—of the group known technically as lachnids—and a scale insect of the group known as coccids. These insects develop in midsummer in considerable numbers, and in the course of their life activities excrete a sweet material, honey-dew, which is rich in melezitose. In dry summers, after the white clover flowers have ceased to yield honey, the bees turn to this honey dew, and collect it, but it crystallizes as fast as they store it away,

¹ *J. Am. Chem. Soc.*, 40, 1456 (1919).

making the honey unattractive in appearance, and if stored in cells to be used by the bees during the winter, disastrous to the bee keepers; for during the cold weather the bees can not get water to dissolve the crystals, and starve. This occurred in 1917 and 1918, and considerable losses were suffered by the bee-keepers from this cause. But in the present year the weather was so moist during July that no melezitose was collected by the bees at all. Several kilograms of this rare sugar have been extracted from honey and purified in the Bureau of Chemistry, so that it is now available for thorough investigation of its properties. It can be readily distinguished from glucose by observation of the crystals in the honey with the polarizing microscope.

Milk with high apparent acidity: FRANK E. RICE. Individual cows were found giving milk with titratable acidities as high as .22 per cent. Several tests were applied to this type of milk as well as to normal milk both fresh and sour. The results were as follows: (1) Formaldehyde titration indicated that where high casein was present, high apparent acidity might be expected. On the other hand, some samples were found with high apparent acidity which were not unusually high in casein. (2) Titration by the Van Slyke oxalate procedure indicated that phosphates were always somewhat higher in this class of milk. (3) Electrometric and colorimetric methods showed the hydrogen-ion concentration to be similar to that of normal fresh milk. (4) Electrical conductivity was no higher than in normal milk. (5) Methylene blue and alcohol tests were always negative. (6) High solids and solids-not-fat usually but not always accompanied high apparent acidity. (7) This condition was always found in the early stages of lactation but occasionally also in late stages. (8) Observation did not indicate that feeds were a factor in causing high apparent acidity.

Effects of sulphur in manure-phosphate composts: W. E. TOTTINGHAM. Sulphur and rock-phosphate have been composted with manure, both separately and together. Analysis after four months of fermentation has shown the production of high titratable acidity where sulphur was present, with consequent increases of citrate-soluble P_2O_5 , where rock-phosphate was also present. Application of these composts to pure sand, together with nutrient salts, to sandy soil and to silt loam for greenhouse cultures of barley has led to increased yields of seed from the sulphur-phosphate compost, as compared with the compost of phos-

phate alone. Similar results have followed the application of sulphur and rock phosphate to field plots of barley in unmanured sandy loam. The peculiar, outstanding feature of the results has been that sulphur alone has shown as great seed producing power as the combination of sulphur with rock-phosphate, under these conditions.

The quantities of preservatives necessary to inhibit and prevent alcoholic fermentation and the growth of molds: MARGARET C. PERRY and GEORGE D. BEAL. Sterile dextrose broth, to which known quantities of preservative had been added, were inoculated with pure cultures of *Sacc. cerevisiae* and *P. glaucum*. The tubes were incubated at room temperature until positive results were obtained in check tubes. In case of no gas formation or of failure to obtain a visible growth of mold, dextrose agar plates were poured to determine the point at which complete sterilization took place.

Shark meat as an edible product: ALLEN ROGERS. This paper deals with the use of shark meat as a food product and shows that it would be possible to secure approximately 200,000 pounds of this material daily or 75,000,000 pounds annually. Assuming that the market price could be set at 10 cents it shows that at the present time we are wasting a food product with a value of \$7,300,000. The edible portion of the shark consists of about 50 per cent. of the weight of the body and resembles in its texture and flavor either the halibut or sword fish. In some markets this product is now being sold under the name of deep sea sword fish and a certain species of shark known as dog fish is being canned and labelled grey fish. Cooking experiments have shown the food to be very palatable and nourishing.

CHARLES L. PARSONS,
Secretary

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