in recent years in connection with the development of certain pathological conditions due to the lack of these chemically unknown constituents in diets apparently adequate in protein, fat, carbohydrate, mineral components, and calories.

A series of studies was undertaken with the object of obtaining further evidence of the changes occurring in biological material and with the hope of obtaining some insight into the chemical nature of the changes. This part of the work was limited to vegetables and included enzymes, proteins, and carbohydrates.

The properties of the oxidase, peroxidase, catalase, and amylase of cabbage, carrot, yellow and white turnip, tomato, and potato juices were studied at different hydrogen ion concentrations. Certain changes in the enzyme actions and properties were found on dehydrating these vegetables, air-blast dehydration producing considerably greater changes than vacuum dehydration.¹

An extended study of potato amylase was begun. The action of this enzyme on potato starch as it exists in the juice pressed from the potato and on Lintner starch prepared from potatoes was found to be different. Optimum conditions with both were found at a hydrogen ion concentration very nearly 10^{-6} N, approximately the acidity of the natural juice. On naturally occurring starch good action was obtained in more acid solution, but practically none on Lintner prepared starch. The conditions were reversed in the more alkaline solutions, marked action on prepared starch and very little on natural starch.

The titration curves of the juices were obtained by plotting the hydrogen ion concentrations (in terms of p H) against the amounts of standard acid and alkali required to obtain these hydrogen ion concentrations. Differences were observed between the titration curves of the juices from the fresh and the dehydrated vegetables. These indicated that a change took place on dehydration in the sense that the acidic constituents were increased, more so in air-blast dehydration than in vacuum dehydration.

A study of the physicochemical properties of the proteins of potato, tomato, and carrot, was made.² The hydrogen ion concentrations, iso-electric points, and titration curves of the juices of these vegetables and the proteins prepared from them were determined. The proteins were separated and purified by several different methods, including precipitation at the iso-electric points, salting out, and dialysis. It was found that every physical or chemical treatment modified the properties of these proteins to some extent, as evidenced by the titration curves, and that apparently the least change in their preparation was brought about by precipitation at the iso-electric points.

The effect of different methods of dehydration on the carbohydrate constituents of carrots, turnips, cabbage, and potatoes, was determined. A full description will appear in a future issue of *THIS JOURNAL*. Reducing sugars, soluble starch and dextrins, and insoluble starch were determined in fresh, vacuum-dehydrated, and air-blast-dehydrated products. No changes were observed in these constituents as a result of the dehydration processes.

The physiological actions of the dehydrated vegetables are being studied by Dr. Maurice H. Givens of Rochester University, by Dr. K. Sugiura of General Memorial Hospital, New York, and by others and will presumably be communicated later.

The work described in this part of the investigations shows that dehydration does not produce changes which can be observed by ordinary chemical methods; that physicochemical methods show changes in fresh vegetables on very simple treatments and also some changes in these same vegetables on dehydration, greater in air-blast dehydration than in vacuum; and that changes in enzyme actions may be caused by dehydration, greater in air-blast de-

hydration than in vacuum. In general, it appears that enzyme action is the most sensitive index of change taking place in animal or vegetable matter susceptible to simple tests, but that modifications in the enzyme actions need not necessarily be accompanied by changes in food hormone properties or in the nutritive values of foodstuffs.

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CHARCOAL IN SWEDEN

By J. W. BECKMAN

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It is a well-recognized fact all over the world that Swedish charcoal iron stands at the very top of iron products; its reputation is of long standing and its name has become a by-word when high-grade iron products are spoken of.

Sweden does hold large deposits of high-grade iron ores. Enormous tonnages of these ores are shipped to most industrial countries of the world including the United States of America, but these alone do not make the Swedish iron world-famous. It is the superior quality of the charcoal used as a reducing agent that gives the Swedish iron its excellent characteristics.

The charcoal demands for an iron industry, even of the size of Sweden's, are enormous, and recently some illuminating statistics have been published showing in detail the production of charcoal there, all of which is consumed by the iron furnaces.

Charcoal is derived in Sweden from three sources. The principal source is that of pit-charcoal operations out in the woods and forests of Sweden; next in importance is the pit charcoal obtained from the waste from lumber operations and paper mills where slabs and sides are made into charcoal; the third source is the by-product charcoal oven which contributes only a comparatively small amount of charcoal, yet at the same time represents considerable financial returns on account of the commercial value of the by-products obtained.

The statistics deal principally with the production of the years 1914 and 1915, but, due to the intensive war activities, it is safe to assume that the charcoal production during the later war years has increased tremendously.

Charcoal produced during 1914 in the forests of Sweden amounted to 55.9 million bushels, 20.8 million bushels were obtained from the wood wastes of lumber mills and paper pulp plants, while 7.1 million bushels were derived from the by-product charcoal ovens operating on stumps, mill waste, and other wood—a total production of 83.8 million bushels of charcoal for the year 1914.

During the year 1915 the charcoal made in pits from mill waste, as well as in the forests, amounted to 94.4 million bushels, while in by-product ovens 6.2 million bushels were obtained, or a total production of 100.6 million bushels.

All the charcoal made in Sweden is that obtained from soft wood and a bushel weighs about 14 lbs., giving a total tonnage as follows:

YEAR	TOTAL WEIGHT, TONS	PRICE PER TON	TOTAL VALUE
1914.....	536,320	\$22.50	\$12,067,000
1915.....	636,000	\$22.50	15,900,000

All this charcoal is consumed by the iron industry in Sweden, a part of which is now using electric shaft furnaces for the purpose of saving the charcoal for reduction purposes only, producing in this way close to three times as much metal with the same amount of charcoal, the electric energy supplying the heat necessary for the reduction.

But in addition to the value of the charcoal alone the by-products obtained from the oven installations represent considerable value.

From the 7.1 million bushels of charcoal produced in by-

¹ K. G. Falk, G. McGuire and E. Blount, *J. Biol. Chem.*, **38** (1919), 229.

² E. J. Cohn, J. Gross and O. C. Johnson, *J. Gen. Physiol.*, **1919**.

product ovens in the year 1914 the following quantities of by-products were obtained:

	Tons
Tar.....	6122
Heavy tar.....	180
Wood oil.....	201
Wood alcohol, 100 per cent.....	524
Turpentine.....	297.5
Formaldehyde.....	227
Acetate of lime, 80 per cent.....	917
Acetone.....	5.5
Creosote oils and various other products.....	53

The value of these chemical products vary naturally with the market conditions. While in 1914 their aggregate value was the

same as that of the charcoal with which they were simultaneously produced, during the later years of the war the by-products plants have been enormously prosperous due to the high prices of chemicals.

These details from the Swedish industry serve as an indication to all countries with large and extensive lumber operations of what may be done and what should be done for the purpose of preventing a national waste and creating from the same a national wealth.

BALBOA BUILDING
SAN FRANCISCO, CALIFORNIA

FOREIGN INDUSTRIAL NEWS

By A. McMILLAN, 24 Westend Park St., Glasgow, Scotland

CARBON ELECTRODES FROM NATURAL GAS

It is interesting, says *Engineering* 108 (1919), 326, to point out that natural gas especially when not sufficiently plentiful for lighting purposes may be cracked to produce electrode carbons. The gas is passed through pipes which are suitably heated so as to produce a mixture of soot and tar. The mixture is briquetted and then baked. The electrodes so obtained are free from ashes and the proportion of tar in them can be varied by adjusting the temperature to which they are heated. According to the *Journal für Gasbeleuchtung* of March 17, Dr. E. Szavasy of Budapest was making carbons in this way from the natural gas found in some parts of Hungary.

A COLLOIDAL SILICATE

In the course of the work of the Department of Scientific and Industrial Research, attention has been called to a certain colloidal silicate apparently not hitherto in use, which may possibly prove to be of commercial value, especially in the textile industry. A limited number of small samples may be obtained on application to the Department of Scientific and Industrial Research, 15 Great George St., Westminster, London.

FERMENTATION GLYCERIN

In connection with the production of glycerin by the alcoholic fermentation of sugar, a paper recently appeared in the *Schweiz. Chem. Z.*, 18-19 (1919), dealing with the effect of adding a reducing agent to the fermenting liquor. According to Oppenheimer, the glycerin is formed by reduction of glyceraldehyde or dihydroxyacetone into which the hexoses are primarily broken up. The author found that acid reducing agents were unsuitable, but sodium sulfite produced a greatly augmented yield, whereas Pasteur (1857) obtained from 100 g. of sugar with yeast 3.6 g. of glycerin, Oppenheimer (1914) with yeast juice obtained 3-12 g., while Schweitzer with yeast and sodium sulfite obtained 21.3 g. The yield obtained by Eoff, Linder and Beyer (1919) using a yeast and sodium carbonate was 20-25 per cent.

HYDRAULIC ROCK BLASTING

A hydraulic service for the blasting of rock and especially for the demolition of concrete piers and foundations is briefly described in the *Zeit. für Schiesswesen* for May 2, by Dr. Tübben of Westfalia. A pressure pipe leads to a cylinder, 85 mm. in diameter, in which eight pistons move one after the other in telescope fashion. The cylinder is inserted in a hole drilled into the rock by an electric motor. The pistons are forced out and crack the rock. The drilling of the holes about one inch in depth is said to take 15 to 20 min. and the blasting 5 min. When the rock is cracked, a tap is opened and the water allowed to spurt back. The device is said to have proved very successful in mines and quarries where the concussions of explosives would be dangerous.

GLYCERIN SUBSTITUTE

Oil and Color Trade J., 56 (1919), 58, quoting from a German patent, says that the soluble magnesia salts of butyric acid form good substitutes for glycerin on account of their high viscosity, neutral reaction, and low freezing point, their suitability being further improved by a slight addition of alcohol or glycerin; for example, a 30 per cent aqueous solution of magnesium butyrate with 5 per cent alcohol remains homogeneous at -20° C. and exhibits no tendency to crystallize. For many purposes a 23 per cent solution of the butyrate is sufficient. The preparation is not corrosive, dissolves to a clear solution in water, has a high solvent action on many substances, and is miscible with glycerin and other substitutes.

TRADE OPENINGS IN ITALY

The following inquiries for sources of supply from firms in Italy have been received by the Chamber of Commerce for Italy, 7 Via Carlo Felice, Genoa. Communications regarding the inquiries should be sent to the Secretary of the Chamber. A Turin chemist would buy for his own account or represent on commission manufacturers of chemicals, pharmaceutical specialties, etc. A Genoa merchant would buy on his own account or handle on commission, soap, perfumery, and other such articles. A Genoa firm of produce merchants is desirous of forming connections with colonial produce exporters, edible oil refiners, etc. Another Genoa firm would represent mineral oils and such articles.

USES OF GLAUCONITE

Bulletin 77, 1919, by E. S. Simpson (Geological Survey, Western Australia) on the sources of industrial potash is opportune in its treatment of glauconite. It is pointed out that a mixture of a greensand with superphosphate renders much, if not all, of the potash in the glauconite water-soluble. The alunite which occurs in veins of kaolinized rock is stated to be widely distributed over the belt of weathering and contains 9 per cent potash. In view, however, of its possible origin in other cases through sulfur bearing waters, there seems no reason why it should be confined only to weathered masses of rock.

RE-USE OF PERISHED RUBBER STOPPERS

A simple method of rendering hard perished rubber stoppers again serviceable for use is given in a recent issue of the *Zeit. öffentliche Chemie*. If the rubber stopper is not entirely perished it can be restored to a usable condition by turning off the hardened portion in a lathe, the turned surface being finally smoothed with sandpaper. The softer the stopper the greater must be the rotation of the lathe in point of speed. The hardened surface of a boring in a rubber stopper is simultaneously removed by means of a round file, the stopper being rotated in a lathe.