

in a leaf, it was necessary to find some other substance which would serve the purpose, and lead chromate was found to be very suitable. The formulæ used are given and also the cost of each and of the spraying. Samples from the control and sprayed

plots were tested by tea-brokers, and their reports are given, the tea treated with the sprays, especially that containing resin and sodium carbonate, in addition to lead chromate, being generally preferred. Rain was found to have little effect, provided the spray had dried.

### Food and its Preservation.<sup>1</sup>

THE work done under the direction of the Food Investigation Board of the Department of Scientific and Industrial Research during the year 1919, although its primary object may be said to have been of a practical nature and mainly devoted to the various means of preserving animal and vegetable food, serves well to show how such an object requires previous investigation of many fundamental and purely scientific problems. On account of the strictures that have been made as to the support of pure science by the Department in question, we may take note that it is pointed out in the report before us that "the application to industry of many of the researches is not immediate, and often not obvious." Such results will be especially referred to in the course of this article, but it is not intended thereby to minimise the value of the practical work of the Board.

With regard to the freezing of meat and fish, a valuable series of researches was undertaken on the phenomena occurring in the freezing and thawing of systems containing colloids and electrolytes, with especial reference to the separation of the constituents of such systems and to the diffusion of salts through their solid phases. Our knowledge of the properties of these systems has been greatly enlarged by this work, and a general report on it is now being prepared. Attention may be particularly directed to the fact that by sufficiently rapid cooling to a temperature which corresponds to the eutectic of a saline solution the separation of frozen water as a visible phase is avoided. Thus, on thawing, the system returns to its original state and the irreversible separation of the colloidal material does not take place, as happens on slow freezing at a temperature only a few degrees below the freezing point of the system.

The conditions of growth of bacteria and moulds were naturally subjects of immediate interest. It is well known that bacteria growing in a particular medium, after a period of multiplication, gradually die off. This is shown by Dr. Graham-Smith, in the report, to be due, not to accumulation of toxic products of their own activity, but to the exhaustion of some specific food material. Bacteria of another species are able to grow in a medium which has previously been exhausted by a different species so

far as its own growth is concerned. An interesting fact brought out by researches on the "black-spot" mould (shown to be a species of *Cladospodium*) is that it will grow at a temperature of  $-5^{\circ}$  C. It is clear that the protoplasm in the cells does not freeze, although the expressed juices of plants usually freeze between  $-2^{\circ}$  and  $-3^{\circ}$  C. No doubt capillary forces are responsible for the lowering of the freezing point in the narrow cells.

The question of the discoloration of fruit led to an investigation on the nature of the enzymes responsible for oxidation in plants. An important fact in relation to the general theory of the mechanism of oxidation was brought out in an examination of linseed oil. It was found that the oil oxidises slowly in air without the presence of any kind of catalyst, although in the oxidation system of the cell there is evidence of the presence of a catalyst accelerating autoxidation. In connection with enzymes the work on pectin production may be mentioned.

Of more strictly chemical interest is the discovery that glycerol can be replaced in fats by mannitol, such fats being similar to the corresponding glycerol esters and behaving in the same way as foods. Other work giving an insight into the chemistry of the production of glycerol itself was also undertaken. Of practical importance for workers with the products of degradation of proteins is the method devised by Mr. Foreman for estimating the simpler products of bacterial decomposition. A curious fact is that the equilibrium position reached in the autolysis of beef is not the same as that in the case of mutton, suggesting that the presence of more than one phase in the heterogeneous system of the cell must be taken into consideration.

The work of the Engineering Committee of the Board, as would be expected, has been mainly industrial, but the systematic investigation of the heat-flow through various materials and the loss of heat by convection from plane surfaces may be referred to here as of general scientific interest.

We may note, finally, that the Board has obtained a grant to build and equip a research station at Cambridge for biochemical and biophysical investigations at low temperatures.

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### The Older Palæolithic Age in Egypt.

PROF. C. G. SELIGMAN, at a meeting of the Royal Anthropological Institute on January 11, read an important paper on "The Older Palæolithic Age in Egypt," embodying the results of an attempt made in 1914 to secure definite stratigraphical evidence of the antiquity of implements which, if found in Europe, would be classed as Chellean, Acheulean, or Mousterian. The sites visited were Abydos, Thebes, Tel-el-Amarna, Meir, and Wady Sheikh, and a short trip was made to the Fayum. Some areas, however, may be described as flintless;

flints of Palæolithic type were very common in the neighbourhood of Thebes and Abydos, but were scarce near Meir and Tel-el-Amarna, and did not include either Chellean or Acheulean types. Wady Sheikh showed no definite Palæolithic types, but specimens of early historic date were valuable for the light they threw on the patination of high desert specimens.

The implements found included hand-axes (Chellean type), hand-axes with borer point (not found in Europe), and finely worked ovates (Acheulean type). The points, side scrapers, borers, hollow scrapers, and tanged points (spear- or arrow-heads) Prof. Seligman grouped together as Mousterian, not because

<sup>1</sup> Department of Scientific and Industrial Research. Report of the Food Investigation Board for the Year 1919. Pp. 36. (London: H.M. Stationery Office.) Price 6d. net.