

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.¹

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° C. It is clear that the protoplasm in the cells does not freeze, although the expressed juices of plants usually freeze between -2° and -3° 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.

W. M. B.

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

¹ 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.

they were specially typical of the Mousterian culture, but for reasons connected with the localities of the finds, stratigraphy, and patination. Also included in the group were two forms not occurring in Europe, namely, "crescents" and a heavy drawing-tool, for which the name "tortoise point" was proposed. Forms transitional to Capsian, or Capsian, were notched flakes, end-scrapers, hollow end-scrapers, nose end-scrapers, end-borers, and asymmetric end-borers. From the morphological point of view the river-drift types were unmistakable, while the Mousterian types, so far as the borers, scrapers, and points were concerned, could be paralleled precisely from European forms, while the non-European forms could either be derived from well-known types or were produced by an identical process. A certain number of implements could not readily be referred to Chellean, Acheulean, or Mousterian technique, and, although they might be classed in Europe as Aurignacian of a coarse type, Prof. Seligman was inclined to regard them as highly developed Mousterian modified by Capsian influence from the north.

The great majority of the implements from the Thebaïd present a more or less lustrous surface of various shades of reddish-brown. Specimens of different shades of dull white occur, but only in wadies and "wash-outs." This marked difference in coloration was undoubtedly due to the fact that the white specimens had only comparatively recently been weathered out of the gravels forming the banks of the wadies.

In reference to the stratigraphical evidence for the age of these implements, Prof. Seligman gave a detailed account of the geological character of the area in which they were found. Implements of a highly developed Mousterian type, without the charac-

teristic brown patina of the palæoliths which have been exposed to weathering, have been found *in situ* in undisturbed gravels of Pleistocene age.

An interesting discussion followed the reading of the paper, in which several points of importance were touched upon. Mr. Reginald Smith argued that while patination was an indication of great age, absence of patination did not indicate the reverse; the oldest types of French cave implements showed no patination. He also asked if Prof. Seligman had been able to correlate relative antiquity of type and shade of patination. In reference to the geological data, he was of the opinion that further evidence was required to establish the Mousterian character of some of the implements, especially in the case of those not collected by Prof. Seligman himself. Mr. M. Burkett briefly reviewed recent French work on this subject, and cited the results of a correlation of type and patina which had recently been made by the Abbé Breuil in a series from Tebessa (Southern Algeria). Mr. H. Peake pointed out that the Mousterian industry appeared to have developed further in Africa than in Europe, where its development had been interrupted by the Aurignacian type, and he suggested that this might be due to more favourable climatic conditions on the former continent. It had been stated that no Solutrian culture was found in Africa, but in this case it was difficult to account for the resemblance between certain Saharian and the Solutrian implements. Prof. Fleure said that Prof. Seligman's evidence pointed to a continuous development from Mousterian to Capsian; geographical conditions suggested that at this period there was a great difference between the climates of Africa and Europe.

Tides in Small Seas.

TWO important papers on the tides in small seas have recently been published by the Vienna Akademie der Wissenschaften. The first, in Bd. 96 of the *Denkschriften*, is the latest of a series of researches by R. Sterneck, jun., on the tides of the Adriatic; the second, in Bd. 129 of the *Sitzungsberichte*, is the sixth part of A. Defant's researches on tides in "Mittel- und Randmeeren, in Buchten und Kanalen," and concerns the tides of the Irish Sea. Both investigations are applications of hydrodynamical principles, assuming from observation just sufficient to give or replace the "boundary conditions" where the sea communicates with the larger body of water. Both treatments depend on the elongated nature of the sea in question and utilise charts of soundings after the manner initiated by Chrystal for the longitudinal seiches of lakes. Defant makes separate applications to the Bristol Channel, Liverpool Bay, and Solway Firth. In each case the assumed type of motion may be regarded as a longitudinal oscillation sustained by the tides outside, together with a transverse gradient maintained by the longitudinal current in virtue of the earth's rotation.

Sterneck considers separately the four chief semi-diurnal and the three chief diurnal harmonic constituents; Defant considers mainly the semi-diurnal spring tides. In each case the agreement with observation is remarkable. That for the Irish Sea is not so close as that for the Adriatic, but this is to be expected when the deviations from a canal of slowly varying section and the ratio of tidal range to water-depth are taken into account. Friction is neglected altogether by Sterneck for the Adriatic, but is an important element in Defant's explanation of the Irish Sea tides, in which the amount is of the same order as that used by G. I. Taylor. The negligible importance of friction in the Adriatic may be ascribed to its greater depth and much smaller currents as compared with the Irish Sea. Sterneck calculates the longest free period of the Adriatic to be about 23 hours as against the 16 hours of previous calculations by the "Merian" formula. The larger number agrees well with the observed seiches, and shows the possible error of rough methods. Defant estimates the longest free period of the Irish Sea to be about 18 hours.

J. P.

Paris Academy of Sciences: Loutreuil Foundation.

REQUESTS for grants to the amount of 219,600 francs were received by the Academy. Six of these were refused on the ground that they were presented by persons belonging to universities already in receipt of funds from M. Loutreuil. A total sum of 131,200 francs is allocated by the council of the foundation to the following:

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I. Grants to Establishments named by the Founder.

(1) National Veterinary School of Alfort: 8000 francs for the construction of a special room for researches relating to the therapeutics of cutaneous and respiratory diseases.

(2) National Veterinary School of Lyons: 3200 francs to François Maignon, for the purchase of