

settlement. The maximum diameter of smoke particles in the absence of thick smoke haze is about $1\frac{1}{2}$ microns, while during thick smoke haze the maximum reaches about 3 microns. Fig. 2 shows that the relation in London between number and weight of particles is usually such that 10,000 particles per c.c. corresponds to 1 mg. per cubic metre. It is not suggested that this relation holds good for all types of dust, but it shows that the automatic recorder gives trustworthy comparative results for city air, where the colour of the suspended particles is usually black.

Horticultural Research.

THE growing recognition of the importance of research work in connexion with the fruit industry is emphasised by the Annual Report issued by the National Fruit and Cider Institute at Long Ashton, Bristol. The year 1923 was the first since the outbreak of the War in which the work could be conducted under relatively settled and stable conditions, and it was marked by steady progress as regards both advisory and research work. The direct and practical bearing of the research work upon the current problems of fruit growers is very noticeable, and though many of the results are still preliminary or tentative, they open up suggestive lines for future progress.

The manurial experiments on fruit trees in pot cultures have been continued to study the effect upon growth of the omission of the various essential elements in turn. Leaf scorch affected many of the plants, but an increase in the amount of potash entirely prevented the development of scorch, while a reduction of nitrogen retarded it and reduced its amount. An examination of the root systems of various fruit trees shows that under many systems of planting there must be considerable overlapping of roots, introducing a serious element of competition which probably acts as a severe check to growth in many cases. This research is being continued in connexion with the danger of planting up orchards of large trees with soft fruit, if the latter is left too long on the ground. In connexion with the damage wrought by the apple blossom weevil it is pointed out that isolated efforts of control are unlikely to be efficacious, but that co-operative action is essential for success. Direct control methods must be associated with hygienic conditions in the fruit plantation, and a scheme of procedure is outlined, embracing a sequence of scraping, spraying, and banding the trunks, followed by the collection of capped blossoms in May. Other pathological investigations deal with egg-killing washes, the effect of sulphur on black currant mite, "red plant" in strawberries and its correlation with "cauliflower disease," purple leaf blotch of strawberry, and the infrequent disease of pear leaf blister.

A most interesting investigation is that of cold process fruit preserves. Under ordinary methods of preparation, jams, jellies, and fruit juices are subject to prolonged high temperature, to the detriment of their flavour, colour, and aroma. With the "cold" method the consistency of the product must be such that micro-organisms do not develop, a condition that can be secured by increasing the sugar content to 62-65 per cent., or less if the acidity of the fruit is high. Jellies and fruit juices give very satisfactory results, but more difficulty is experienced with the jams. Large-scale trials are being made to determine whether these methods are suitable for development under commercial conditions.

Another aspect of the work is shown by experiments

on the "buffing" of willows, a process whereby, after prolonged boiling in water, a mineral-brown colour is imparted to the wood of willow rods. Freshly cut willow rods can only be peeled for a short time in the spring, owing to the rapid production of new wood which interferes with satisfactory peeling. "Buffed" rods can be peeled throughout the year, and the introduction of the process has been of great importance to the growers and to the basket industry. Improved methods are being sought and possibilities of industrial application worked out.

The chief lines of work at the Fruit and Cider Institute have been touched on above, but various other researches are being carried out, some of which may lead to more extended inquiries in the future, and others are of importance in their relation to the main investigations.

Problems of Human Nutrition.

THE investigation of human nutrition dealt with in the report before us¹ was undertaken in the autumn of 1922 during a period of depression for those engaged in the coal mining industry. Details regarding the actual food consumption were obtained from 140 families distributed in five different counties. The general result of the inquiry shows that though the average consumption of food in Derbyshire was sufficient for a healthy life when judged by accepted standards, the average diets in Northumberland, Lancashire, Stirlingshire, and in particular Durham, were not so satisfactory. In the latter county the weight of the miners' children was slightly below the county average, though it seems probable that factors other than a deficient diet may have been partly responsible for this. The Committee is cautious in drawing conclusions, since the number of families investigated was not large, and it was recognised that the method adopted of reducing each family to the equivalent of "average men" for the purpose of assessing the nutritional value of the family diet is not free from objection.

The Committee has assumed that the average daily food requirement of a miner is equivalent to some 3400 calories. This figure has, however, not been ascertained by direct observation, but is inferred from a consideration of the numerous data already available on the energy output of man under different conditions of rest and work. Prof. K. N. Moss, in an investigation of the effects of high underground temperatures on the miner, has recently given details of the actual food consumption of a selected number of miners in different districts who had a high reputation for steadiness and industry. These figures show an average daily energy intake of well over 4000 calories, a value much in excess of that assumed by the Committee. Moss's selected subjects were clearly well above the general average, but if we regard the Committee's estimate as approximately true for this general average, it is apparent that there may be very great differences of energy expenditure between different individuals employed in the same industry. It is not alone the actual work done in the mine that matters, for much energy may be expended by the miner in walking to and from his work and in recreation in his spare time: as regards the last two items there is the possibility of great individual and local variations.

It is evident that further investigation is required regarding the actual energy output under everyday conditions not only of miners, but also of workmen in

¹ Medical Research Council. Reports of the Committee upon Quantitative Problems in Human Nutrition: Report on the Nutrition of Miners and their Families. Pp. 59. (London: H.M. Stationery Office, 1924.) 1s. 3d. net.

other industries involving heavy manual labour. So long as uncertainty prevails as to the true energy requirements of the individual, the assessment of the nutritional value of the family diet in the manner adopted by the Committee cannot acquire its full value. In times of financial stress the full diet of the wage-earner may have to be maintained at the expense of other members of his family, and the children may in the end be the real sufferers. It is to be hoped that the Report of the Committee is but the prelude to further investigations which will dispel the obscurity which still surrounds some of the important practical problems of human nutrition. The work is bound to be very arduous, but it is worth doing, for apart from its value to the physiologist it has a direct bearing on modern economic questions.

Haddock Biology.

MR. HAROLD THOMPSON has made a useful contribution to our knowledge of the life-history of the haddock in the report before us.¹ This fish is of increasing commercial value, and its abundance fluctuates considerably from year to year. By the researches which Mr. Thompson describes, he certainly brings nearer the time when the causes of these fluctuations will be better understood, and he foreshadows the possibility of being able to predict for two or three years ahead any special scarcity or abundance of the fish in a particular area such as the North Sea.

Great importance has been attached to the accurate determination of the age of the fish. For the haddock it has long been recognised that the most trustworthy determinations of age can be got by studying the markings on the scales. The author has, however, subjected the whole method of age determination in this fish by means of the scales to a minute and critical examination, and especially has been at great pains to study scales taken from many different parts of the body. This careful but tedious examination has justified the methods employed, and the satisfactory conclusion has been reached, that if a few normally shaped scales be taken from a haddock, it is possible in about 95 per cent. of cases to read the age from the number of annual zones marked on them; and further, that by measuring these zones and comparing their length with the total length of the scale in each instance, one can calculate the sizes attained by the fish at the end of each previous year of its life.

The author considers that North Sea haddock grow on the average 17.5 cm. in the first year, though the range of size is considerable, from 11 to 21 cm. The greatest growth in this, as in other years, takes place in the autumn, and growth practically ceases in November, when the scale has formed about 22 rings (sclerites). The first scales make their appearance when the fry are about 3 cm. long. In 1922 and 1921, yearling haddock were sparsely represented in the North Sea, but the 1920 brood was extremely abundant, as shown by the prolific numbers of one-year-old fish in 1921 and two-year-old fish in 1922, in the later months of which year they formed the mainstay of the Aberdeen market haddock supply. The year 1904 was a similar good brood year for haddock and was followed by an abundant fishery of three-year-old fish in 1907.

The rate of growth of the haddock varies in different regions. In the same latitude the best grown fish

¹ "Fishery Board for Scotland: Scientific Investigations, 1922. No. 5: Problems in Haddock Biology, with Special Reference to the Validity and Utilisation of the Scale Theory. 1: Preliminary Report." By Harold Thompson. Pp. ii+78+3 plates. (Edinburgh and London: H.M. Stationery Office, 1923.) 7s. net.

are found in shallower and warmer water, whereas there is a diminution in growth rate with increase of the depth from which they are captured. South Iceland and Faroe haddock exhibit faster growth than those captured in the North Sea and off the northern coasts of Scotland, for there favourable temperature conditions occur throughout the year, and the temperatures are so much less variable that it is often difficult to note the annual zones on the scales.

The paper is a valuable contribution to the literature of British fisheries.

The Iron Ores of China.

THE widespread distribution of local iron smelting in China led to the general belief that China possesses some of the greatest reserves of iron ore in the world. More careful investigation has failed to confirm some of the earlier estimates, and has led to the under-rating of the quantity of available Chinese iron ores. The series of Memoirs on the iron ores and iron industries of China, of which the first part by F. R. Tegengren has been issued by the Geological Survey of China,¹ will correct the wild statements that have been made on both sides. The first part deals mainly with the ores of the northern and eastern provinces, and is accompanied by 16 plates and a folio atlas including 39 maps. The first map, in which the names are conveniently given both in English and Chinese, shows the general distribution of the iron ores in eastern China. It does not mark those in far western China, where there are many primitive furnaces which smelt iron for their neighbourhood. Their supplies of ore are ample, but are too remote to be of service except locally at the present time.

The Chinese iron ores are of three main types. The first type comprises the pre-Cambrian bedded ores, including the banded quartzitic ironstones that are widely spread in western Australia, India, and South Africa. Of the pre-Cambrian ores the most interesting geologically are the stromatolitic ironstones, of which one of the best known representatives are the Wabana ores of Newfoundland. The author discusses their origin and attributes them to chemical precipitation; he discourages the view of their organic origin, though on grounds which are not convincing; and he recognises that they may indicate the existence of pre-Cambrian life. The second group includes the contact ores which have been formed beside intrusive masses of granodiorite along the lower Yangtze; they include some of the most important and extensive iron ore deposits in China. The third group includes the nodular ironstones of the Palæozoic rocks and they are found especially in north central China. They have been largely mined for the local smelters, and exaggerated estimates have been often formed of their quantity. The author concludes that in most cases the nodules are in beds too thin and too scattered to be of value for working under present conditions on an extensive scale.

The text is issued in both English and Chinese. The volume and the maps are well printed and edited; misprints, such as are probably inevitable when a work by a Swedish author is issued in English and printed in China, are commendably few, though the reversal of the headings of phosphorus and silica in the table on p. 38 gives at first a startling aspect to the analyses. The subsequent parts of this important memoir will include a summary of the distribution of the iron ores of the circum-Pacific region. J. W. G.

¹ "The Iron Ores and Iron Industry of China, including a summary of the iron situation of the Circum-Pacific Region." By F. R. Tegengren. Mem. Geol. Surv. China, Ser. A, No. 2, Pt. I., 1922-23, 180 pp., 16 pls. Accompanied by Atlas of 39 maps. Also Chinese Text.