

Food Preservation *

RESEARCH has shown the importance of freshness in food. For an industrialised nation, living in large towns, this is not always easily ensured, even in the case of home-grown supplies, and the difficulty is greatly enhanced when the food must be transported long distances before it reaches the consumer. Refrigeration has provided an empirical solution, but our knowledge, especially on the biological side, is as yet inadequate to ensure that the subtle properties of freshness are sufficiently conserved. Research on the preservation of food is therefore of the utmost importance to the inhabitants of Great Britain; but in spite of the fact that the food imported in 1931—comprising the greater part of the wheat and fruit consumed, half the meat, poultry, eggs, and dairy produce, and a smaller proportion of the fish and vegetables—cost about one million pounds a day, the amount spent on research by the Food Investigation Board during 1931 was less than £50,000.

The necessity for economy has led to a reduction in the Board's expenditure, but the staff has not been reduced. Owing to the specialised nature of the work, losses of personnel cannot immediately be made good when circumstances warrant an expansion of the Board's activities, so that reduction of staff would delay the resumption of normal progress to an extent out of all proportion to the economy effected.

Food investigation is of value, not only to the consumer, but also to the producer both at home and in the Empire overseas. The Board has received financial assistance from the Empire Marketing Board, and co-operation with other parts of the Empire is ensured by the presence of representatives of the Dominions, India, and the Colonial Office, sitting as assessors, at the Board's meetings. The experimental work on the cold storage of food has now reached a stage when the results obtained can be transferred to the full commercial scale. The co-operative survey of the New Zealand frozen lamb industry, which was mentioned in last year's Report and full details of which are about to be published, was so successful that the Board felt that this collaboration should be continued. A Consultative Group has therefore been formed, comprising the Director of Food Investigation (Sir William B. Hardy) and members of his staff, the assessors mentioned above, and representatives of the shipping lines nominated by the Chamber of Shipping of the United Kingdom and the Liverpool Steamship Owners' Association.

The Report is this year arranged in four parts, describing respectively the researches carried out at the Low Temperature Research Station, at the Torry Research Station, and at the Ditton Laboratory, the three research stations of the Board; the fourth part deals with extramural researches carried out at the National Physical Laboratory and the Imperial College of Science and Technology. The different sections deal with meat, bacon, fish, fruit,

and vegetables, as well as problems of biological engineering and canning. Each is written by the investigator who has carried out the research described, and presents the results obtained in a form which is best described as that of a detailed summary. References are given to the original papers from which fuller information may be obtained. It is not possible here to do more than refer to one or two of the more important points raised by the Report; but it is hoped to consider certain other aspects at a later date.

A preliminary survey of the problems associated with imported edible offal has been carried out by T. Moran. It was found that there is scope for improvement in grading and preparation, packing and freezing. Evaporation of water appears to be the most serious problem. These tissues are of importance for the preparation of certain medicinal products, and at present the Dominions supply only a negligible fraction of the total imported for this purpose. Prompt freezing after removal from the animal is essential, and no opportunity for thawing during storage and transport must be permitted. In New Zealand, a further difficulty has to be overcome, since the demand is almost exclusively for ox's glands at present, mainly on account of their size.

It has been shown by E. H. Callow that the transport of unsmoked mild-cured bacon from Australia and New Zealand is impracticable under existing commercial conditions, since the fat becomes rancid after less than two months' storage even if a temperature so low as -10° C. is used. Gas storage may be the solution of this problem, since the rancidity is due to the fact that the fat takes up oxygen even at this low temperature. On the other hand, carcasses of frozen pork can be transported successfully and used as pork or for the manufacture of bacon. It has also been found that smoking retards the subsequent development of rancidity, whatever the temperature of storage, within the range 15° C. to -20° C., but cannot prevent it entirely.

In the case of fish, it has been found that after freezing in brine, it is necessary to store at temperatures so low as -20° to -25° C. instead of the usual -4° to -12° C., if alteration in the fish is to be prevented. Fish stored at the lower temperature can be smoke-cured: hitherto one of the objections to frozen fish has been that it is quite unsuitable for smoking. The conditions required for properly smoking haddocks and herrings have been examined by A. Lumley. To give a 'finnan' finish to the former, seven hours' smoking was necessary, the temperature being gradually raised from 80° to 90° F., and the relative humidity being less than fifty per cent at 80° F. To produce a 'kipper' it was necessary to extend the time of curing to twelve hours and to raise the temperature to 95° F. for one hour and to 100° F. for the final hour. Most of the smoking in commercial practice is carried out by rule-of-thumb methods. It is suggested that the incomplete control and the length of the process

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is the reason why so many dyed kippers are on the market: dyed herrings can be smoked in 5-6 hours.

Work has been continued on the gas-storage of apples in the experimental stores at the Ditton Laboratory. At present, control over the composition of the atmosphere is obtained by regulated ventilation with fresh air, but there is now some evidence that a closer control over the percentages of oxygen and carbon dioxide in the store may be required in the case of certain varieties. Experiments have also been carried out on the gas storage of pears and bananas and the cold storage of potatoes. J. Barker has found that between $+3^{\circ}$ and -1° C. there is a great increase in the amount of sugar found in the potato after sixty days' storage, the concentration being inversely proportional to the temperature. The sweetening is attributed to a change in the organisation of the protoplasm. It was also found that transference from a low temperature to 15° C. for a period of only twenty-four hours completely arrested any further increase in the sugar content in the cold store.

Most fruits and vegetables undergo autolytic changes when hard frozen, even at -20° C., the only exception so far observed being raspberries. On thawing such frozen raspberries, colour and

flavour were perfect and the texture was scarcely altered. Blanching will permanently inhibit these changes: after blanching, peas, runner beans, and potatoes can be frozen, and on thawing again are superior to the canned vegetables. Strawberries can be frozen in syrup at -20° C., and the thawed fruit is suitable for fruit salads, etc. Plums and cherries, treated similarly, turn brown on thawing; they can, however, be frozen after blanching.

Work has been continued on the corrosion of iron and tin. It has been found that ferrous salts accelerate the corrosion of tin in the presence of air by acting as carriers of oxygen. Ferric salts accelerate the corrosion of iron in the presence of air over the range of hydrogen ion concentration likely to be met with in the canning of fruit, the combined effect of air and the ferric iron being much greater than that of either of them alone, especially at a hydrogen ion concentration of about pH 4. Further work has also been carried out on the engineering and physical problems of the maintenance of temperature and composition of the atmosphere in stores such as ships' holds. In the storage of fruit, the metabolism of the fruit itself affects both the temperature and atmosphere of the store, and complicates the problem of maintaining a constant environment.

International Astronomical Union

THE fourth general meeting of the International Astronomical Union, attended by representatives of twenty-four countries, was held at Cambridge, Massachusetts, on Sept. 2-9, under the presidency of Sir Frank Dyson. At the opening session the Union was welcomed by the Hon. C. F. Adams, Secretary for the Navy in the United States cabinet, and by Dean Bernice Brown, head of Radcliffe College. The members of the Union were for the most part accommodated in the dormitories of the College, a very convenient arrangement giving every opportunity for the informal discussions in small groups which add so much to the real value of the meeting. The full meetings were held in the Alice Longfellow Hall of Radcliffe College, and the commissions met in the various lecture rooms. All the arrangements for the meeting were made with a thoroughness and completeness, which it would be difficult to equal, by a local committee with Prof. Harlow Shapley as chairman and Mr. L. B. Andrewes, following the late Miss Adelaide Ames, as secretary.

The formal work of the Union lay in the sessions, reports and resolutions of twenty-seven committees: these dealt with such subjects as meridian astronomy, planetary observations, *Bureau International de l'Heure*, variation of latitude, *Carte du Ciel*, stellar parallaxes, variable stars, stellar spectra—to mention only a few of them. The volume of draft reports is nearly two hundred pages long and can scarcely be summarised here, but reference may be made to the reports on solar physics, by Dr. St. John, on standard wave-lengths by Prof. A. Fowler, on stellar photometry by Dr. Seares,

on radial velocities by Dr. J. S. Plaskett, and on the observations of Eros for solar parallax, by Dr. Spencer Jones.

Among resolutions passed by the General Assembly were the following: The equinox of 1900.0 was adopted for catalogues other than catalogues of precision, by agreement among the various groups of astronomers interested in the question. A proposal to fill a gap existing in astronomical bibliography between 1880 and 1899 was approved. A proposal to establish the vertical circle of the Pulkovo Observatory in as nearly equal a southern latitude as possible in the hope of improving fundamental declinations, met with much sympathy and full approval. A number of recommendations adopting fresh standard wave-lengths and urging further work on the subject was adopted. The printing of a list of designations for lunar formations was approved. Further exploration of the meteor craters in North Africa and Siberia was urged, also an extension of the meteor work now being carried on in Arizona. A resolution from the commission on radial velocities earnestly commending any project for obtaining urgently needed data in the southern sky, and welcoming the possibility of establishing a large reflector in South Africa in the event of the transfer of the Radcliffe Observatory, was passed unanimously by the General Assembly. Financial help was granted towards the printing of further volumes of the *Carte du Ciel*. Other grants were continued mostly at a reduced figure, and a new grant was made toward the reduction of the Eros observations.