pratense". This semi-parasitic species is difficult to raise from seed, but experiments have shown that it will grow on a variety of woody plants, such as species of *Betula*, *Calluna* and *Rubus*. It is very variable, 28 intraspecific taxa having been described, and much of this variation follows geographical trends in the British Isles. Plants become shorter in the north, and this is correlated with a reduction in the number of leaves and branches. The leaves also become shorter in the north and west. Anther-length is 20–30 per cent shorter in Northern Ireland than elsewhere. Superimposed on this clinal and geographical variation is ecological variation; the leaf width/length ratio divides the populations into those of calcareous and acid habitats, but the distinction is not clear-cut. Population samples were grouped according to habitat types and an analysis was made of the variation, using 8 vegetative and 3 floral characters, all of them quantitative. This showed that there was random distribution of genes or gene combination in the small isolated populations in which the plant occurs, and that similar groups of characters occurred in similar habitats. Some populations had cleistogamous flowers and were effectively inbreeding units. The variation pattern in certain morphological characters was, however, markedly different from that observed on the Continent.

Dr. J. K. Morton (Birkbeck College) gave the final paper on "Introgression in West African *Eulophia* Orchids". Two species, *E. cristata* and *E. millsoni*, were studied in the Accra coastal plains where their hybridization is associated with the disturbance caused by peasant agriculture, although their ecological preferences are different. Populations were analysed in order to discover the extent and direction of the apparent introgressive hybridization which was taking place. Ten characters associated with the structure of the flower and inflorescence were scored, such as height of inflorescence, number of flowers, and angle of lateral lobes of the lip to the horizontal; the introgression was demonstrated by pictorialized scatter diagrams and histograms. A remarkable feature which emerged was the unilateral gene-flow, back-crossing to the *E. millsoni* parent being frequent while none to *E. cristata* was detected. The introgression affected the biology of the populations, the *millsoni* hybrids extending the range of the species. Vegetative features were not included in the introgression studies since the leaves appeared 2–3 months later than the flowers.

The general discussion was opened by Dr. V. H. Heywood (University of Liverpool), who commented that the day's papers illustrated the tendency of botanists to emphasize breeding systems and dispersal mechanisms in consideration of speciation and adaptation, while zoologists place greater emphasis on phenotypic plasticity. He suggested that botanists should pay greater attention to the adaptive role of plasticity: they should not only be concerned in experimental taxonomy with determining genotypes, but also with the way that particular phenotypes may be selected. Given a range of expression of a particular genotype, only certain parts of that range will be selected in particular areas; this was well shown by Dr. Cook's paper on Batrachian *Ranunculi*. The problems of the taxonomic recognition of plasticity have also not been adequately considered.

Other points of importance which arose out of the papers were the effects of changes in the breeding system from outbreeding to inbreeding, the lack of synchronization of karyotype evolution with morphological and other genic evolution, as in *Lathyrus*, and the polytopic origin of taxa, such as had been suggested in the water buttercups and in *Melampyrum*. The question of long-distance dispersal in *Clarkia* was raised, and a discussion ensued, in which Dr. Gillet, Dr. Jones and Prof. Valentine took part. There was also a brisk exchange of views on the likelihood of the polytopic origin of species, especially in polyploid groups.

V. H. HEYWOOD
D. H. VALENTINE

FOOD TECHNOLOGY IN GHANA

TOO many people nutrition means no more than the study of foods and their use by the living body. But with increasing evidence of widespread malnutrition throughout the world, and of a deteriorating situation in regard to world population and food supplies, much emphasis needs to be placed on the importance of work outside the laboratory on problems associated with providing people everywhere with an adequate diet. In many parts of the world an immediate problem is a means of conveying foods from one place to another. For example, fruit, the sale of which provides a livelihood for some people, may be rotting on the trees because there are no roads on which it can be transported to other people who might benefit by addition of fruit to their diet. Sometimes roads exist, but mechanical transport is inadequate or excessively costly. Lack of adequate means of distribution may seriously limit the use of fish, and while many people suffer the effects of protein malnutrition, fishermen not far away suffer economic disaster because they cannot get rid of harvest gluts. Not only are roads and mechanical transport involved in the distribution of foods but in addition a means of preservation through cooling, drying or other means.

Ghana is a country where transportation and preservation of foods are of great importance. Owing to the geographical features of the country adequate diets can only be ensured when there is a free exchange of foods grown in the north with those grown in the south. The Government of Ghana has wisely taken steps to deal with nutritional problems, and has included food technology in its programme. The Government has called on the World Health and the Food and Agriculture Organizations for assistance in developing a public health nutrition programme; Dr. Francis Aylward, as Food and Agriculture Organization consultant (see also p. 20 of this issue), has recently examined problems of food supplies and nutrition in Ghana and has submitted a report on this subject*.

Dr. Aylward's report is a most useful one, not only for those interested in Ghana, but for many others

* *Report to the Government of Ghana on Foods and Nutrition*. By Francis Aylward. ETAP Rep. No. 1449. (Food and Agriculture Organization of the United Nations, Rome, 1961.)

as well. The results of inquiries made under the auspices of United Nations' specialized agencies are in the first instance of a confidential nature and are designed to help the Governments concerned. However, many excellent accounts are frequently being composed, which could be most useful to workers in special fields, and to administrators in many countries. Such a report is that under discussion, and it is to be hoped that if the Government of Ghana receives requests for copies of the report it will be willing to assent to its distribution.

Dr. Aylward has dealt systematically with many aspects of food technology and its relation to the provision of adequate diets. He has wisely emphasized inherent economic and social dangers of thoughtless introduction into a developing country of new techniques. Such is the perversity of man that valuable methods of preserving much-needed food may be diverted to less needy ends. Thus one of the most important recent changes in Ghana noted by Dr. Aylward is the introduction of ice-plants which provide refrigeration for the storage of animal products, but refrigeration is now also being used to an appreciable extent for cooling commercially prepared soft drinks. This is not necessarily to be deplored; but administrators must be aware that when they sponsor the introduction of a given technique for one end, it may be used also for less-worthy, and sometimes undesirable, purposes.

Usually modern techniques lead to the production of foods which are more expensive than the original materials. When the product enables some people to obtain foods necessary for their well-being and which they would not otherwise obtain the cost must be ignored. But very often a new product, especially if it is commercially advertised, is regarded as of particular value and may be purchased at unwarranted expense by those not specially in need of it. In developing countries this is unfortunate and may be a factor leading to malnutrition among sophisticated urban groups. Any means, therefore, of producing food products cheaply is to be encouraged. Perhaps one of the most significant advances in this connexion has been the use of plastics for food packaging. Not only is this kind of material cheaper than metal containers, but also it may provide a better means of preservation than some alternatives. Dr. Aylward directs attention, for example, to the satisfactory use of plastics in the storage of fish meal produced in Ghana.

Proposals have been made for the introduction into Ghana of 'filled milk' composed of skimmed milk powder, water and coconut oil. This poses a troublesome problem for public health administrators. Though such a milk product may be produced relatively cheaply in some circumstances, thus leading to its widespread use among the poor and needy, there is not yet enough evidence of the effects, especially on infants, of repeated ingestion of coconut oil which contains a high proportion of saturated fatty acids, and also a good deal of lauric acid. It is often the case that new preparations of food such as filled milk are readily accepted by the public before administrators are in a position to control their use should this be necessary.

While it is true that the application of scientific methods in the growth, storage and preparation of foods carries possible hazards, it is of the greatest importance, as Dr. Aylward states, to realize that food technology has developed in order to meet the urgent problems associated with feeding ever-enlarging urban communities; modern food industries are essentially a response to public needs. "And it is precisely for this (as well as other reasons) that the food scientist and technologist has a role to play in Ghana."

G. R. WADSWORTH

CHOOSING FOREST SPECIES

WORLD requirements for wood and wood products are steadily increasing, though the forms in which it is being used and the kinds of timber most in demand are constantly changing. World forest resources, which are badly distributed in relation to centres of consumption, are becoming inadequate to meet requirements, and acute shortages are already being felt. At the same time, many natural forest types have relatively low production, and the kinds of wood produced are often not those most in demand.

This is particularly true of vast areas of tropical forest where the luxuriance and variety of the growth make them economically a poor proposition. Many of the species in them are hard, heavy and difficult to season, and are unsaleable. Even in Europe, the large areas of oak forest, often of low quality, which used to meet demands for fuel and heavy constructional timber are becoming a burden on the market. If future demands for wood are to be met in the quantities and in the kinds of product required, it will be necessary to improve the productive efficiency of forests all over the world, and to grow more intensively those particular species that will be most in demand. The kind of species most likely to be favoured have recently been discussed by Prof. M. V. Laurie of the University of Oxford (*Span*, 5, No. 1; 1962).

It is difficult to estimate what will be wanted half a century or more ahead, but this is what the forester has to try to do when formulating his objects of management and considering what species he ought to be growing. Heavy timbers have largely disappeared from constructional uses. On the other hand, softwoods are still used in large quantities for house building and other structural purposes, and recent developments in laminated construction have provided new outlets for softwood timber in short lengths and of relatively low quality.

Present indications are that softwoods will be in greater demand than hardwoods for most purposes, and that general purpose timbers, which at the same time can be used for core stock or laminated construction and can be chipped or pulped, are most likely to be wanted in large quantities in the future. This trend is already reflected in the large programmes for planting conifers in many parts of the world. Although it may not be difficult to envisage the kind of trees that are likely to be needed to meet future requirements, the question of what can be grown on the sites available is more difficult to answer. Here the limitations of climate, soil and biological agencies are crucial. Different species vary greatly in their tolerances of conditions differing from those of their native habitat; so much so, in fact, that it is impossible to say with any degree of certainty whether