Another notable figure at Yungan is Dr. Shih Yen-Han, head of the provincial meteorological survey, the best in China. The Yungan station is an elaborate one with an excellent library, and we were able to forward to Britain a complete set of the records and publications. Printing in Fukien is better than elsewhere in China, so that works such as Dr. Ma Ting-Ying's "Past Climate and Continental Drift" have been published by the Survey. The provincial agricultural college, too, was well-equipped and active under the leadership of Dr. Yen Chia-Hsien, and it was interesting to visit the power plant, producing 130 kW. from an 11m. fall, with entirely Chinese-made piping, turbines, and dynamos. Mention should also be made of Huanan Women's College at another city, Nanping, where neat science teaching facilities were found; if Ginling College at Chengtu is China's Girton, this is its Newnham.

Unfortunately, it has been necessary to use the past tense in this article also. Having established a line of communications with these various institutions, I returned to the west, a few steps ahead of the Japanese, only to find that with the loss of Kuangsi, all contact with the scientific workers in Fukien was cut off, while the institutions in Kuangtung were before long disbanded and destroyed. After the examinations in the summer of last year, the students at Chungshan, Lingnan, and Tungwu Universities, and their agricultural and medical colleges, disbanded; and later the teaching and research staff also dispersed into the zones away from the roads and railways, taking with them in bits and pieces what equipment they could. It is said that the Chungshan Medical School has re-formed itself at Meih sien, in eastern Kuangtung, a district not occupied by the Japanese; but if so it is quite isolated. We have been able to welcome a few scientific men here mentioned, such as Liang Po-Chiang, Ling Shu-Mo, and Chêng Tso-Hsin, who managed to find their way to West China, but the majority have remained behind, and nothing is known of their activities. Thus the two Kuang Provinces have suffered the worst damage to science and technology during 1944, while Fukien is completely isolated. This is extremely regrettable, because some of the best scientific institutes in China were in the far south-east.

NUTRITION IN JAPAN

By DR. GEOFFREY H. BOURNE

JAPAN is a country of eighty million people and her pre-war empire (including Manchuria) embraced 105 million people. The problem of feeding such numbers has been considerable, and the difficulties which Japanese communications experienced as a result of Allied air and sea attack did not make this problem any simpler. It will perhaps be of interest at this stage, therefore, first to discuss Japanese diet and then to analyse the food situation in that country.

Generally speaking, the chief types of food now eaten in Japan include polished rice, with a certain amount of fish, beef, veal, pork and mutton and a few eggs, together with some Western vegetables and soya bean in various forms, particularly as soya bean curd. This last is made by soaking the beans in water, mashing them, straining the mass through cloth and solidifying it by the addition of magnesium

chloride. Rice was first eaten in Japan in the unpolished condition; but as soon as the milling and polishing of rice was introduced the custom of eating the grain in this condition began to spread and rapidly extended to all classes of the population.

The diet of the Japanese cannot be described as good. Milk and butter, for example, play little part in it. Butter was probably introduced in Japan during the latter part of the eighteenth century and milk was introduced some time later by a Korean who brought it from Chosen. The first milk was used in medicine and was served only at great feasts, and butter was also served at feasts pounded up in rice cakes. Although both butter and milk were introduced early in Japan, neither entered into the lives of the common people.

In general, the Japanese diet can be described as predominantly carbohydrate in nature, which results, in effect, in an increased demand for vitamin B₁. At the same time, the vitamin B₁ content of the diet is reduced by polishing the rice, which is the predominant carbohydrate. Dr. E. C. Grey says (League of Nations publication, 1928) that the physical nature of rice is such that people are bound to use it in the polished condition. Rice must be consumed as a grain; it lacks gluten, the elastic constituent of wheat flour which enables it to be made into bread and macaroni. "The natural rice grain," says Dr. Grey, "is rough to the tongue and unpleasing to the palate, it is not so easily digested and has none of the pleasing appearance of the pure white grains of polished rice."

The Japanese diet is also deficient in fat. In 1928 the daily intake of this nutrient was only about 15-20 gm. a day, which is only about one quarter of the desirable intake. 85 per cent of the fat which was consumed was vegetable fat and therefore contained no fat-soluble vitamins. In 1925 the average daily calorie intake in Japan was approximately 2,732. This is the figure for food before it was prepared for the table. Allowing 10 per cent for wastage the figure comes to little more than 2,400 calories, which, considering that the main mass of the people are manual workers, was too low.

Protein was derived principally from fish and soya beans, and a very small quantity from beef and other meats in certain classes. Fish and other marine products are not entirely satisfactory as the sole sources of animal protein because of the variation in the seasons. When there is a good season, fish is so plentiful that it is used as manure; when a bad season arrives there is not enough fish to go round. Soya bean, which contains a high-quality protein, forms the most stable source of protein.

The feeding of Japanese children, particularly those of the working classes, has always been extremely poor. The lack of milk is one of the principal reasons for this. Even that which is available is produced under very unhygienic conditions, and the effects of drinking it are usually far from good. In fact, this unattractiveness of animal foods is possibly one of the reasons (apart from cost) why Japanese people eat very little of them; another reason is, of course, that few people know how to cook them. As a result of the deficiency of cow's milk, Japanese children tend to be breast-fed for a very long time. Attempts are made to use a substitute milk made from the soya bean. Infant feeding and hygiene does not appear to have improved very much in recent years, for the average mortality for the five-year period 1934-39 was still 115 per 1,000 live births, which is

four times the rate for New Zealand and twice the rate for England and Wales.

The imperfections in the Japanese diet have been known to the rulers of that country for some time, and they have realized, too, that bad diet makes bad soldiers. Twenty years ago, therefore, the Japanese Government requested the Imperial Institute of Nutrition in Tokyo to take up the questions, first, of improving the Japanese diet, and secondly, of making Japan so far as possible self-sufficient in foodstuffs. The Japanese attack in the Pacific was obviously already taking shape in the minds of the Japanese rulers. Dr. Saiki, who was director of the Imperial Institute of Nutrition, set out originally to formularize the Japanese diet, so that by about the present time the entire population of the country could be fed on what could be described as 'domestic foods' at the cost of a few pence per person per day.

But Japan was not big enough herself for this scheme to be entirely effective. She has only relatively recently become a military or an economic power of any significance. In the first decades of the sixteenth century she lived in a turmoil of civil and foreign wars. For more than two hundred years her people were not permitted to emigrate or to colonize, and as a result Japan did not become a colonial power until relatively late in world history. It was with intensive agriculture at home and in the colonies that she became practically self-sufficient in quantity of food by 1930. But that was not enough; her diet was still very bad in quality. Dr. Saiki's job was to advise how this could be improved and to work out the minimum effective diet for the population. To this latter end he estimated in his Institute the energy value of something like ten thousand different native Japanese foods, and he worked out some hundreds of different menus at the same time. The Imperial Institute commenced a great deal of propaganda on nutrition by publishing pamphlets, and, immediately before the War, there were regular broadcasts from the various radio stations on the subject of nutrition, and all the Japanese women's magazines printed articles on food. The custom of mass feeding was begun some years ago. Communal kitchens were established and it is probable that most of the factories in Japan were drawing the food for their workers from a communal kitchen of one sort or another. Dr. Saiki also produced a number of different dishes, some of his creations including cats stuffed with peeled locusts and grasshoppers baked in soya bean sauce. Despite these attempts to make Japan self-sufficient in food, she is not herself able to produce all the food she needs.

With her colonies, however, and including Manchuria, Japan was before this War able to make herself practically self-supporting in this respect; 99 per cent of all the rice consumed in Japan was grown by herself and her colonies, Chosen and Taiwan. Japan could not have been self-sufficient in soya beans without Manchuria, because 60 per cent of her soya beans are imported from that country. One of the reasons why Japan was able with the aid of her colonies to become almost self-sufficient in food was because, for the fifteen years or so preceding this War, she had carried out a highly intensive cultivation based on the use of relatively enormous amounts of chemical fertilizers. At the onset of war with China in 1936 much of the chemical industry in Japan had to be turned over to producing explosives instead of chemical fertilizers, and as a result Japan

had in 1939 one of the worst crops that she has had for a very long time. It has actually been described as a disastrous crop failure. Despite this fact, however, her food situation was still very good, particularly as she was able to import as much rice as she needed from countries like Burma, Siam, French Indo-China and to a lesser extent occupied China itself. On the other hand, food brought from these countries must come in ships, and shipping was at a premium in Japan during the last months of the War.

As a result of this, the use of rice for the production of *saké*, which is a variety of wine, was very much reduced, there was widespread food rationing in the towns, and there was also a limit to the amount of food that could be bought at any one time. For example, all householders' purchases were restricted to not more than ten days' food. The amount of food allowed was worked out first according to the age, and, secondly, according to the occupation of the person, in a similar way to that in which the rations were graded in the German ration system. The rations were fairly generous, and as a result of the War there does not seem to be any particular shortage of food in Japan. There was, however, a considerable shortage of fish, and fish is almost the entire source of animal protein for nearly all of the Japanese population. The chief reason for this is that the supply of fish in the areas close to the shores of Japan seems to have become reduced in the last few years, and as a result the fishermen had to go farther afield; but towards the end of the War it was difficult to do so because they could not get sufficient fuel to carry their boats far out to sea. Therefore, the only food in which Japan was seriously reduced was protein, and while this is scarcely likely to have very much effect on the adult population, it will affect the children and adolescents. A considerable amount of food used to be imported from Formosa to the homeland.

The eighty millions of Japanese people live on about 150,000 square miles of land. The official population density is given as 374 people per square mile. A very high proportion of the population is engaged in food production, owing to the small-farm system and its wasteful use of labour. Even the introduction of mechanization would be difficult owing to the topography of the country. It should be noted that even with the intensive farming of the last ten or fifteen years Japan proper has not been able to reach a self-sufficiency in food. Even with her colonies she was only able to reach a 99 per cent sufficiency. Presumably Japan's colonies will now be removed from her jurisdiction and at the same time her industrial development will be stifled so that she will not be able to make the engines of war. The Japanese people will not be able to obtain enough food once their colonies have gone unless they can import food, and they will certainly not find any country willing to send them food unless they receive adequate payment by means of useful imports from Japan. Japan will no doubt be permitted light industries, but Japanese goods will receive a poor welcome for some time to come in most countries. If Japanese colonies are taken from her then food will have to be sent to her to save her eighty millions from starvation. While this is no plea that Japan should retain her colonies, the above fact must be faced and any plan for the future nutritional well-being of the world must take eighty million Japanese into account.