This was six times the quantity landed in Aberdeen, and was worth five times as much, namely, £22 million.

The distance of these prolific fisheries makes it more difficult to keep the catch in good condition on the voyage home, a journey that can take up to a week, after which inland distribution has still to be undertaken. In comparison, voyages to the nearer waters of the North Sea and Faroe Islands are much shorter and the catches much smaller. Since 1947 the Torry Research Station has been paying particular attention to the problems of improving the preservation of the distant-water catch, most of which consists of cod and haddock, and the establishment of the new Laboratory will provide a permanent base on the Humber which will make further work in this field much easier.

In opening the Laboratory, Sir Ben Lockspeiser pointed out that, of the three main sources of animal protein, meat and dairy produce have to be largely imported, much of it from dollar areas, while fish is mostly obtained by our own efforts. In consequence, it is rather surprising that although the British are consuming substantially less meat to-day than before the Second World War, they are, in fact, consuming per head less fish. Sir Ben gave as an example the kipper, a typically British product, of which, he said, the consumption is now only about half of what it was in 1947 and 1948. People will not eat fish willingly unless it reaches them in good condition, fresh or processed, and this raises questions of refrigeration, storage, smoking and canning. It would be wise to assume that Britain will have to rely increasingly on fish in the foreseeable future, and it becomes, therefore, more than ever important that the resources of fish, which are obtained with such cost in capital and labour and all too often in human life, should be husbanded. The Department of Scientific and Industrial Research, continued Sir Ben, is opening the new Laboratory on the Humber in the heart of the white-fish industry in order to help to come to grips with the practical problems of distant-water fishing. Industrial science is in the nature of a joint enterprise between industry and science. Although every now and then science takes a leap forward, creating a revolution in thought and practice, which it is vital for an industrial nation to recognize and take advantage of, more frequently advance is step by step, often in very small steps, every one of which has to be tested in practice. The Department of Scientific and Industrial Research attaches great importance to working in partnership with all sections of the industries it serves.

After the opening, visitors saw an exhibition of some of the results of recent work of Torry Research Station. The bacteriological problems of keeping fish fresh were illustrated, and an account was given of the methods used and results obtained in an extensive survey of the conditions of handling fish aboard distant-water trawlers, showing the temperature distribution in the fish holds and the loss of weight of fish during transport. Even with the most careful handling aboard ship, however, not all fish can be landed from the distant waters in a really fresh condition by the normal process of gutting, washing and icing. Another exhibit described work on the problems of preserving fish by freezing at sea, with samples of fish frozen in a new type of contact freezer now being developed for the purpose. The deleterious effects of the cold storage of fish at temperatures of − 10° to − 15° C. for a few months was demonstrated by contrast with the perfect condition of similar fish stowed at − 30° C. for up to twelve months.

Various physical, chemical and engineering problems involved in the preservation of fish by smoking and drying were illustrated. Some demonstrations were given of the recently developed humidity-sensitive element which utilizes some electrical properties of anodized aluminium (see p. 177 of this issue). Several by-products of the fishing industry, and new methods of recovery, were described as well as current research on fish proteins, and work on fish skin being carried out at the Zoology Department of the University College of Hull for the Department of Scientific and Industrial Research.

The buildings for the new Humber Laboratory have been erected by the Ministry of Works and comprise four laboratories, a workshop, offices, a library, and space for handling, freezing and smoking fish on a semi-commercial scale. Altogether, this new establishment will function as an integral part of the Torry Research Station, providing facilities for workers from that Station as well as for its own as yet small staff, and continuing work on various fronts—for example, certain aspects of fish chilling, freezing, smoking and drying. It is hoped that, in addition to *ad hoc* problems, the programme will include basic biochemical and physicochemical studies in fish preservation.

PROBLEM OF FUTURE WORLD FOOD SUPPLY

THE Nutrition Panel of the Food Group of the Society of Chemical Industry has arranged a series of meetings devoted to the subject "Food and the Future". The opening meeting of the series, under the title of "The Problem of Future World Food Supply", was held on December 10, with Dr. J. I. M. Jones in the chair.

Mr. F. Le Gros Clark spoke on the "Yardstick of Population" and posed the question, "Will there soon be too many of us ?", pointing to an eventual finite limit to the population that could be supported by the world. Famines have always been local and temporary, never of world dimensions, but the real cause for alarm is that no one can foresee in what precise corner of the world hunger may occur. Optimists, he said, believe that men, even after a long period of suffering, will learn to control their fecundity, while pessimists foresee only disaster.

Mr. Le Gros Clark traced the growth in population over the centuries, suggesting an eventual total of 8,000–12,000 million before stability is reached. The problem of their food supply requires not mainly a technological transformation but a revolution in the habits of men and methods of farming—an agrarian revolution on a world-wide scale. The initiation of this revolution, he said, should have started fifty years ago, before the pressure of population had become so great. Nowadays, we cannot be excused because of ignorance, as perhaps could our grandfathers, who had less factual knowledge.

Most nations to-day, protested Mr. Le Gros Clark, are not giving the agricultural scientist and food chemist half the chance they should have of meeting the challenge. This is a matter for governments and people who move governments. The task before us,

he concluded, is that of agrarian reform, carried out in such a way as to convert a largely illiterate peasantry into alert, modern farmers who can manage the breeding not merely of their farm animals but also of themselves.

Dr. E. W. Russell dealt with the "Factors Limiting Food Production". In Great Britain differences in output between farms depend upon soil, varying use of fertilizers and varying degrees of farming skill. Large areas of hill lands are producing only a fraction of the food per acre produced by the lowland areas, principally due to climate, lack of plant nutrients in the soil and relatively poor farming-skill in these areas. Skilled and energetic farmers must be attracted back to the hills, and this requires the provision of reasonable living amenities such as housing, transport and recreation in districts very deficient in these.

In the world as a whole, food production is limited by three groups of factors. First there are the inherent factors of the site: lack of soil, water, nutrients or a short growing-season. Then there are factors that harm the growing crop such as diseases and pests. Finally, there are human factors, including lack of skill, low activity due to disease, and social, religious and political brakes on production.

Dr. Russell gave examples of yields of rice in different countries, and showed that the extremely low yield in India, less than a quarter of that in Italy, had been doubled in one area by using better varieties, better water management and simple manuring. Crop production is limited by cold, but new strains ripening in a short season could be grown in cold districts before the frosts came. At the present time, the principal factors limiting wheat production in the Canadian prairies are believed to be lack of men and lack of markets rather than lack of suitable land. Dr. Russell also dealt with irrigation, fertilization of the soil and soil erosion.

A. E. BENDER

ROYAL OBSERVATORY, CAPE OF GOOD HOPE

REPORT FOR 1951

THE report of the Royal Observatory, Cape of Good Hope, chronicling the activities of the Observatory during 1951, has recently been published*. It is satisfactory to know that the modernization of the reversible transit circle, which had been originally built in 1900, was completed in 1951 and it was ready for use in November. An important change was the replacement of the twelve declination circle microscopes by twelve cameras, six on either pier, which, on pressing a button, photograph the position of the declination circle and automatically wind on ready for the next exposure. Various troubles with instruments have been eliminated; one of these arose from the harshness in the sun-and-planet differential through which the guiding motion is applied to the impersonal micrometer; and after trying alternative methods for securing a suitable differential motion, it was decided to retain, with a few minor changes, the form of drive introduced in 1911 by Mr. Hough. The Hipp chronograph, which frequently gave trouble, has been replaced by a new chronograph built at the Observatory and driven by a synchronous electric motor.

The Victoria telescope, now more than fifty years old, was used on 177 nights, 121 for the parallax and proper motion programme, 25 for photoelectric photometry, 19 for Fabry photometry and 12 for obtaining direct photographs in connexion with various photometric programmes. The instrument was also used for observing occultations both photoelectrically and visually. Arrangements have been made for an examination of the declination axis of the telescope, around which the motion has become increasingly stiff during the past few years. The astrographic refractor was used on 146 nights and the 7-in. telescope on 120 nights in connexion with the "Bright Star Programme"; as this is now finished, it is proposed to use the latter telescope only for visual observations, such as occultations and the micrometric measurement of double stars. The 6-in. telescope has been used to observe long-period variables and also for occultation work as well as for visitors. The tower telescope has been used for observing occultations and variable stars, and the photoheliograph is used daily to take two photographs of the sun. There have been developments in the photoelectric equipment during the year, two D.C. amplifiers and two power-packs having been designed and constructed, while great improvements have been made in the occultation apparatus which was described in the 1950 report.

In April 1951 an agreement was signed between the Radcliffe trustees and the Admiralty by which one-third of the time with the 74-in. Radcliffe reflector at Pretoria is made available to observers from the Cape. The scheme is to use the Radcliffe telescope for long routine programmes for which the organization of the Cape Observatory is particularly suitable and which are not likely to be undertaken by individual observers of the Radcliffe Observatory, and two routine programmes have been already started: one of these is for determining the radial velocities of the southern stars; the other is a photographic *Durchmusterung* of the southern Kapteyn Selected Areas. Among the miscellaneous items of the report are included observations of the spectra of a selected list of planetary nebulæ, photographs of extragalactic nebulæ, spectrograms of a number of specially interesting stars, and certain experimental work. The last includes some experiments made in collaboration with the Electronic Division of the National Physical Laboratory as to the capabilities of the new E.M.I. tube for astronomical photometry. Full-scale deflexions were obtained with the 74-in. telescope on stars of magnitude 15 without the use of an amplifier.

So many other matters are dealt with that it is impossible to mention them all, but one or two additional points are worth noticing. Mr. A. N. Cox, of the University of Indiana, visited the Cape Observatory in September 1950 and installed on the Victoria telescope the photoelectric photometer that had been previously used in the United States and at the Radcliffe Observatory. After his return to the Kirkwood Observatory, he compared the stars that he measured in the regions *C*2 and *C*12 directly with the North Polar Standards, and the remarkable thing is that the results were not in agreement with those found at Cambridge. It is suggested that the non-agreement may be merely one more indication of the grossly unsatisfactory nature of the present standard

* Report of Her Majesty's Astronomer at the Cape of Good Hope to the Secretary of the Admiralty for the year 1951. Pp. 20. (Cape of Good Hope: Royal Observatory, 1952.)