

are also exactly duplicated by those of sections taken from normal *Alytes* (Kammerer, 1919, tab. 11, figs. 1, 2, and photographs sent by Dr. Noble).

These five proofs being each conclusive and independent of each other, I should think the nuptial pads in water-bred *Alytes* must be seriously taken into consideration, unless some one should offer another explanation of the coincidence of the five points raised here.

HANS PRZIBRAM.

Vienna II., Prater,
Vivarium, Mar. 26.

Science and Food Production.

IN the very sympathetic notice of my book, "Plant Nutrition and Crop Production," in *NATURE* of Mar. 26, p. 454, the reviewer raises the interesting question how far science has actually helped in increasing the production of food. Statistics show that, in spite of the scientific work, the yield of wheat per acre in England is not much greater than it was fifty years ago, and it is implied that scientific work has in practice achieved little, however interesting its results may have been from other points of view.

The statement is partly true, but the conclusion is entirely wrong. There are several ways in which food production may be assisted by science, among them: (1) increasing the output per acre of land, (2) increasing the output per man-hour of labour, (3) increasing the area of cultivated land. The great development of transport during the past fifty years led to the opening up of new countries, and made the third of these possibilities the easiest; it was consequently adopted. The extension in area of cultivated land has proceeded *pari passu* with the growth of the population, and there are still, as there were fifty years ago, some two acres of cultivated land for each civilised human being. There has been no pressing necessity, and therefore no economic inducement, to increase output per acre.

The great increase in rates of farm wages, however, has compelled an increased output per man-hour of labour, and this has been accomplished. In 1881 on a farm of careful management and careful records it took 117 man hours to grow one ton of wheat; in 1921 only 82 hours were needed. Equally marked changes have taken place in the root crops.

Further, science has greatly increased the certainty of crop yields: catastrophes are things of the past. In 1844 potato blight came to the British Isles, and for forty years its depredations were almost unchecked. It caused the appalling Irish famine of 1845-46, and between 1877 and 1880 its damage in Ireland alone was estimated at £20,000,000. The committee of inquiry set up in 1880 reported that all witnesses, scientific and practical, believed it to be hopeless to prevent the spread of the disease once it had set in.

All this is changed; an effective fungicide now keeps the disease in bounds so that it is no longer feared.

By common consent the worst season of the last century for the wheat crop was 1879, when the persistent wetness and high rainfall completely baffled the farmers of Great Britain. The financial losses were appalling, and the season was long remembered with dread in the countryside. During the present century there have already been three years of higher rainfall, 1903, 1912, and 1924, than 1879, but there was no agricultural crisis. Of course there were losses, but they did not compare with those of 1879, and they are already almost forgotten.

The statement, frequently made, that yields have not increased, is only partially true. Wheat is

commonly taken as the test crop, but this is unfair. It was formerly the most important crop on the farm, but now it is much less important. The high yields of fifty years ago were attained by abundance of cheap labour; to-day this method is not available. New methods have been devised which pay the labourer several times the old wages and which yield at least as much produce per acre. More direct comparison can be made by taking crops in which we have been self-supporting over the whole period and for which therefore the relative importance in the farm economy has not diminished. Precise statistics of average yields are difficult to obtain, but trustworthy experts fifty years ago put the yield of potatoes at about $6\frac{1}{2}$ tons per acre under good farming conditions. Now, however, a good farmer would expect 10 tons per acre, and could reasonably hope for more. Similar increases can be recorded for some of the fruit and market garden crops, as well as the important cucumber and tomato crops.

It is freely admitted, of course, that science has not been the only factor at work. The makers of implements, and fertilisers and feeding-stuffs, seedsmen, the country school teacher, and the farmers themselves have all played their part, but it is impossible to deny that science has largely contributed to the result.

Finally, scientific work has demonstrated that this intensification of production is possible for all farm produce. At the present time much of the knowledge remains unused in regard to certain items such as wheat, lower qualities of meat, etc., because the alternative method of increasing the area of cultivated land still remains open and is cheaper. But obviously this will not always be the position, and it is perhaps the crowning achievement of agricultural science that it is steadily working at methods of intensification, knowledge of which will be imperative directly the area of cultivated land has reached its limit.

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IT WAS far from my intention to suggest that science, generally, had failed to help in increasing the production of food, and least of all to base such an assertion on official statistics of the average yield of wheat. If Sir John Russell had heard Venn's smashing indictment of official underestimating, delivered last year at Oxford, he would not tilt at that windmill. All I need plead guilty to is extreme sympathy with the view that the value of science is not merely materialistic; but until this sympathy is more universal than it is now, the unenlightened public will not cease to clamour for more spectacular results than agricultural science, in its 'slow and painful' progress, has produced in the last fifty years.

THE REVIEWER.

The Sleep of Whales.

VERY little is known about the sleep of whales. They seldom sleep at the surface. Scoresby, speaking of the Greenland whale, says: "Whales are seldom found sleeping, yet instances occasionally occur, in calm weather, amongst ice." I have in my possession a large number of log-books of whaling voyages to the Greenland Sea and do not find a single example recorded. The recently published log-books of Capt. Scoresby, senior, tell the same tale.

Years ago I made a number of voyages to the Greenland Sea with my father, the late Capt. Gray, of Peterhead. On one occasion when we were amongst the ice, and it was my duty to be in the crow's nest, I