of England gives us a distinct advantage over Continental countries, where the harvesting of the beet has generally to be completed by the end of October, owing to the probability that frost and snow will intervene if matters are delayed longer. Where this does not happen, harvesting can be spread over a longer period, extending up to Christmas, and the sugar factory can be employed at a moderate pressure of work over a correspondingly lengthened period. The dampness of the climate of England is no obstacle; the fact that our output per acre is about 25 per cent less than on the Continent is explainable largely by the fact that English farmers have not yet discovered the varieties of beet best suited for the climate—a handicap resulting from the seventy extra years of experience in the industry possessed by their rivals abroad.

Mr. J. Hammond showed interesting diagrams illustrating the variation in the proportional size of different parts of Herefordshire cattle at different ages, in the course of a paper on the effects of climatic conditions on animal production. He showed also how variations of weather affect the chemical composition of plants and, through this agency, the character of the growth made by animals feeding on these plants.

The effect of weather on soils was shown by Dr. Ogg to be greater than had at one time been supposed. Owing mainly to the work of certain Russian investigators, modern soil classification is being made on new and much more satisfactory lines than in the past, the principal difference being that formerly the importance of the geological character of the parent rock, the breaking up and transformation of which is responsible for a particular soil, was over-estimated. Wet climates tend to give acid soils and dry climates alkali ones, temperature coming in as a modifying factor. Without any other data than a knowledge of mean temperature and rainfall and of the character of the humus-supplying vegetation, the distribution of the principal types of soil can be roughly mapped out in any country, and work on these lines is being carried out internationally.

In the course of an account of work at Rothamsted Experimental Station on the relationship between the weather of different months and the effectiveness of various artificial manures, Sir John Russell showed the necessity for employing modern mathematical statistical analysis in order to separate the influence of different weather factors. Once this has been done, the result often leaves for solution a comparatively simple relationship that can be explained by chemical experiment in the laboratory. Stress was laid upon the economic importance of a scientific variation of the chemical proportions of artificial manures in accordance with the predominant weather factors for the crop in question, and on the extent to which the application of such a principle can make the yield independent of the meteorological character of the season.

The second day of the conference was occupied mainly with a consideration of the influence of weather upon insect pests. The general impression gained from these papers was that the subject is a harder one to investigate than that of simple plant growth. This arises partly from the fact that many of the pests are of very small size, and the meteorological data available normally do not define exactly the conditions which the pest experiences. There is the added difficulty that the parasites that exercise so large a control over the severity of the attack of a pest are not normally affected in a similar way to their hosts by abnormal weather. Mr. A. Roebuck, who spoke on this subject, showed that where the host and parasite are oppositely affected, great fluctuations of severity of a pest are to be expected; and that, on the other hand, similarity of reaction to weather tends towards limited variation, and therefore to an absence of epidemics. Dr. W. M. Davies described how humidity affects Collembola (springtail): types with a very primitive breathing system are absolutely dependent upon high humidity, whereas those possessing a more advanced tracheal system can withstand relatively dry conditions.

The conference closed with a very interesting account by R. T. Parkhurst of the way in which fowls can be induced to lay as many eggs in the autumn and winter as during the remainder of the year by artificially increasing the hours of light during the dark days, the result being a satisfactory yield at the time when prices are highest. The method is being applied successfully in the United States, especially where cheap electricity is available.

Migration in Butterflies and Moths.*

IT is well known that locusts migrate, but few realise that similar movements take place in other insects, and particularly in the dragonflies and the butterflies and moths. The evidence for such movements is chiefly of two kinds. First, it is found that some insects exist over large areas only for a short time, and after a period of absence may appear again suddenly in large numbers. Secondly, observers, particularly but by no means entirely in the tropics, have often seen hundreds of thousands of butterflies moving steadily in one direction, sometimes passing for hours on end and sometimes even for days or weeks.

By collecting such evidence it has been possible to get an idea of the regular movement made by some species. Thus the Monarch or Milkweed butterfly of North America is found during the summer throughout the greater part of the continent, even reaching so far north as Hudson Bay. In the autumn all the individuals in the north collect together in great bands and fly a thousand or so miles south to the Gulf States or Southern California, where they spend the winter clinging in masses to trees. In the spring the bands break up and the butterflies fly north, laying eggs as they go, to repopulate the whole area—some completing another thousand or fifteen hundred miles flight on the return journey.

In West Africa, Europe, and western Asia, the greatest migrant is the Painted Lady butterfly, which in the spring crosses the Sahara and Egyptian deserts from some almost unknown sources to the south; crosses the Mediterranean, often in hundreds of thousands; flies more or less northward through Europe, usually reaching the shores of Great Britain in early June, and sometimes individual stragglers are seen in the extreme north of Iceland or within a few degrees of the Arctic Circle. The total distance covered by these flights may be between two and three thousand miles, but at present it is not possible to say with certainty if any one individual flies the whole distance or if it is covered by two successive generations. The butterflies lay eggs as they go and in England a local-bred generation may result in August or September, but there is practically no evidence of the survival of this butterfly in north and central Europe from one year to the next. Another remark-

* Substance of a paper read by Mr. C. B. Williams before Section D (Zoology) of the British Association at Bristol on Sept. 8.

able fact is that there is at present little or no evidence of any return movement towards the south in the autumn.

The common Large Cabbage White butterfly is also a migrant, particularly in central Europe, where about July large swarms seem to originate either in Scandinavia or on islands in the Baltic, and fly southward through Germany in clouds like snowstorms. Some of these flights deviate to the west and may cross the North Sea and appear on the eastern shores of Great Britain.

Similar flights occur in all parts of the world; West Africa, East Africa, South Africa, India, Ceylon, Central and South America, and Australia, all have their migrant butterflies. The sight of hundreds of thousands of butterflies passing a point steadily in a fixed direction day after day is one never to be forgotten. Mr. Williams stated that in East Africa he has seen a 'skipper' butterfly flying to the south on every fine day for more than six weeks, in numbers which reached a maximum of more than five hundred per minute on a 22 yards front. On another occasion at the same station there were simultaneous flights of two different species of butterflies going on in exactly opposite directions for nearly a month, each species keeping strictly to its predetermined path. Further, on one day while these two flights were going on, there was a third flight of millions of locusts moving diagonally across the other flights and not in any way interfering with them.

Nothing is yet known of the reasons for these movements or of the factors which determine the direction of flight. It can, however, be stated quite definitely that the insects are *not* blown by the wind. Examination of a large number of records show that the flights are as often directly against the wind as with it, and may cross it any angle.

Butterflies in migration appear to have an urge to fly continuously in one fixed direction; they appear to be conscious of that direction and make every effort to keep to it in spite of the disturbance due to wind and the presence of obstacles in their path. They usually avoid small obstacles by flying over them, or more rarely round them, but have been seen beating themselves against the wall of a house or entering open windows. Efforts to keep to the desired path have often been observed, and they have been recorded as flying through railway tunnels or in at one side and out at the other of partly constructed buildings, rather than depart from it.

Similar movements occur in many species of moths, but information about them is much more difficult to obtain, owing to the fact that the majority of these migrations take place at night.

Fishing Methods of the Maori.*

THERE appears hitherto to have been little information placed on record concerning Maori fishing methods and devices. Mr. Elsdon Best's monograph, in which every aspect of Maori fishing activity is clearly and fully described, is therefore a welcome addition to the scanty literature which already exists.

Fishing operations in all the countries of the world have connected with them many strange beliefs, weird superstitions, and quaint ceremonies to celebrate special occasions such as the launching of a new boat or the first dip of a new net. Fishing in Maoriland was no exception to the rule, and many strange and interesting rites and usages connected with the craft are described. Many of these have their counterpart in other lands; a few seem to be peculiar to the Maori.

Sea fishing was considered by the Maori to be essentially a task for men. The boats, however, were almost invariably met by the women, to whom the entire subsequent care of the catch was left. Women also were expected to collect shellfish and allowed to take part in the capture of small fresh-water fish, but eel-fishing was confined entirely to men.

The most useful and interesting part of the bulletin is the section dealing with fishing implements, their manufacture and use. Where the conditions were suitable, nets of various kinds were mainly used, chief among them being a kind of giant seine which might be anything up to 1000 yards in length. The making of such a net, the material of which was unscraped flax, was the work of all the inhabitants of a village and was made use of to benefit all the part proprietors of it. These nets were five to six feet in depth, provided with sinkers along the bottom and floats of very light wood (instead of the usual cork) along the top. A point of unusual interest about these seines and the other nets of the Maori is that so far back as can be traced, the knots used for making the meshes were exactly the same as those of our own European nets. How this knot came to be discovered and adopted in net-making by peoples and tribes all over the world amongst whom intercommunication must have been impossible is a riddle yet to be explained.

In addition to the great seines, many smaller nets were employed, including drag nets and set nets, but no mention is made of drift nets. These do not appear to have been used in Maoriland. Line fishing also was largely practised, especially along rocky coastlines where drag-nets could not be employed. Wood, bone, stone, and shells were all used by the Maori in the manufacture of fish hooks. When Europeans arrived in the country, however, the natives soon learned the advantages of metal for the making of such implements.

The bulletin is attractively produced and well illustrated, but appears to suffer slightly from the fact that the author, apart from his researches in producing this work, seems previously to have had little intimate contact with fishermen and fisheries.

* Fishing Methods and Devices of the Maori. By Elsdon Best. Dominion Museum Bulletin No. 12. 1929. Dominion Museum, Wellington, New Zealand. Also obtainable from New Zealand Government Offices, 415 Strand, London, W.C.2. Price: Paper Cover, 9*s*.; Cloth Cover, 11*s*. 6*d*.

Recent Work on Buttercups.

AT the present time considerable attention is being paid to these familiar wild flowers, comprising the genus *Ranunculus*, the largest one in that attractive family the Ranunculaceæ. Parkin has in recent years (*Annals of Botany* 42; 1928) emphasised the fact that in this genus two distinct types of petal occur—one yellow and *glossy*, typical of the common buttercups of our fields and meadows; and the other white (occasionally yellow or even red), with a *mat* surface, exemplified only in Great Britain by the water buttercups (Batrachium section). The former type of petal is probably unique among flowers, possessing peculiar structural features, one of which is the large amount of starch contained in it and restricted to the part that is glossy. It is suggested that this large genus might be conveniently and perhaps