

by sunshine having a lapse-rate more than a thousand times the value of the dry adiabatic lapse-rate (1 deg. F./2,187 in.) and even hundreds of times the so-called 'auto-convective' lapse-rate (1 deg. F./640 in.) at which the density of the air increases upwards. As a by-product of the investigation, it was found that the reduction of surface temperature below the value at sunset was proportional to the square root of the time, in agreement with Brunt's theory of surface-temperature changes on radiation nights, which takes no account of interchange of heat between air and ground and balances radiation loss from the ground against conduction of heat upwards in the soil. The observations were made under dead calm conditions over a level field at a point 100 yards from the nearest boundary, so that vitiation by horizontal influx of colder air seems to be ruled out, and Mr. Lake shows that instrumental errors cannot account for the profiles.

The detailed physical reason for the profile is still obscure. It appears that the air near the ground under calm conditions loses heat by radiation rather than by convection and conduction until a state of radiative equilibrium is reached depending on the water vapour content. The fact that the variation of the surface minimum temperature agreed well with Brunt's theory supports this. It is very desirable, because of the great importance of accurate forecasting of minimum temperatures for agricultural purposes and for general scientific reasons, that an adequate physical theory of the temperature distribution in the lowest foot of the air on radiation nights should be found.

THE CAPERCAILZIE

AN account of the feeding habits and breeding behaviour of the capercaillie has been set out in No. 37 of the Forestry Commission's admirable leaflets. The capercaillie well merited the delightful names by which it was known in medieval times—cock of the woods, horse of the woods, avercalzie, auercalze, wild peacock, wild turkey—for the cock caper is one of the finest game-birds in Europe. In the British Isles, it is found only in the woods and forests of Scotland.

The cock bird is about a yard in length, with the hen capercaillie a foot shorter. Originally, the capercaillie was found in England, Wales and Ireland, as well as Scotland; in England the birds became extinct around 1660-70. In Scotland, the last two positive references to truly native birds seem to be those from the Abernethy and Glenmoriston districts in 1771. The capercaillies present in Scottish woods and forests to-day owe their presence to an introduction of Swedish birds, made in 1837. Then, Lord Breadalbane imported thirteen cocks and nineteen hens and turned them out on his estate at Taymouth Castle, near Aberfeldy, in Perthshire. Unlike previous introductions elsewhere, this one was so successful that after twenty-five years there were more than a thousand birds present on this estate alone.

The typical habitat of the capercaillie consists of hillsides with woods of mature Scots pine. Capercaillie appear to be invading Forestry Commission plantations of Scots pine, larch and spruce when these reach a height of about twenty-five feet.

In winter, the capercaillie's food includes the shoots, buds, leaves, seeds and young cones of the

Scots pine, and occasionally those of other conifers. These, however, form only a small proportion of its total food supply, and where only relatively small numbers of capercaillies are found amid middle-aged or maturing pinewoods, little serious economic damage results. The position may be very different in young, newly established plantations, particularly where these lie close to older woods with a heavy stocking of capercaillies. These birds find the winter buds and growing shoots of the young pines very palatable, and all too often they peck out the leading bud, thus causing serious loss of annual growth, and perhaps a distorted stem. Further damage may be done because of the bird's weight; if it settles on a side branch this may break away from the main stem, causing a serious wound to the tree.

Whether or not control measures are necessary depends on local circumstances. In the older woods, the harm the capercaillie does is negligible. Under other conditions, for example, where the felling of mature woods has driven the birds to take refuge in young plantations, it may be necessary to restrict the numbers of the birds in order to avoid serious loss of timber production. Control is commonly effected by shooting, which, owing to the bird's large size and conspicuous appearance, presents no particular difficulties. Provided it does not become unduly numerous in the younger plantations, this interesting and beautiful bird may be tolerated and even encouraged.

FAT FORMATION IN A DIATOM

THE photosynthesis and formation of fats in a diatom, *Navicula pelliculosa*, using carbon-14 as a tracer, has been investigated in some detail by G. E. Fogg (*Ann. Bot.*, N.S. 20, 78, 265; 1956). Fixation into the following cell fractions was determined: (A) material soluble in 80 per cent ethanol but insoluble in benzene; (B) material soluble both in 80 per cent ethanol and in benzene; (C) material insoluble in 80 per cent ethanol. Carbon fixed in photosynthesis was incorporated, rapidly and in amounts representing up to 70 per cent of the total fixation, into fractions B and C, as well as into fraction A. Considerable variation was found in the proportions of carbon entering the three fractions in the light; in actively growing cells the proportion entering fraction C preponderated over that in B, corresponding to the synthesis of protein, whereas in nitrogen-deficient cells fixation in B was the greater, corresponding to the synthesis of fat.

These patterns changed only slowly, over periods of days, following the transfer of cells to altered conditions of nitrate supply. However, when ammonium nitrogen was supplied to nitrogen-deficient cells a marked change in distribution of carbon fixed occurred within 5 min., fixation in fraction B falling to a low value and that in A rising correspondingly. In cells subjected to prolonged nitrogen-deficiency, fixation in fraction B fell to a relatively low value; but the proportion which this fraction formed of the total dry matter in the cells rose as a result of an increased rate of loss from the cells of constituents other than lipides. The distribution of carbon fixed was also dependent on light intensity. Fixation in fractions B and C rose relatively to that in A as light intensity was increased up to 100 foot-candles but fell again at the highest intensity used, 2,000 foot-candles.