







THE  
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Edited by ARTHUR WESTLAKE ANDREWS.

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Fig. 1.—The Peat Deposits of Upper Teesdale, seen from Cross Fell.



Fig. 2.—Moorland to the north of Ben Griam Beg, Sutherlandshire—average depth of peat 14 feet.

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## THE HISTORY OF THE SCOTTISH PEAT MOSSES.

TO anyone viewing the waste of peat bog covering the upper part of the Tees valley, from the summit of Cross Fell or the undulating plain of peat bog stretching northwards from the summit of Ben Grianm Beg for more than 30 miles, the sombre ragged array of peat bogs, with their sides of crumbling black peat, suggest many interesting questions.

That the peat consists entirely of the wasted remains of ages of vegetation is obvious, and it is this fact which stimulates inquiry. As one walks over the moorland and observes that the peat contains the remains of large trees, often at a considerable depth below the present surface, and that the same features can be traced over the treeless moorland of the north-west of Sutherlandshire, the Outer Hebrides, and even Shetland—where these tree remains can be seen embedded in the peat even to the edge of the cliffs that look out over the Atlantic—it becomes a matter of some interest to examine the peat more closely in order to see what can be made out as to its history.

The most obvious questions which call for solution are such as these:—

(a) Can any definite stratification be made out in the deeper peat mosses; (b) do the plants at the base of the peat

differ from those above ; (c) can any evidence be obtained which points to climatic changes having taken place since the peat began to grow ; (d) does the peat yield any evidence of changes on a great scale in the distribution of the vegetation of our country. It might be perhaps well to take one typical area of mountain peat, and see the answers it gives to these questions.

Some of the most rugged ground in the south of Scotland is found on the borders of Wigtonshire, Kirkcudbrightshire and Ayrshire. It consists of two parallel ranges of hills running north and south, enclosing a glen some ten miles in length and three miles in breadth. The western range attains an average elevation of 200 feet, rising to 2764 feet in Merrick and Kirriercoch Hill. The hills consist largely of granite, which here has weathered into sharply-featured outlines, over which are scattered scores of rock tarns. The eastern range—called the Kells range—is in striking contrast to the Merrick Hills, for here the outlines are smooth and flowing, and there is a general absence of rock exposures. The long valley lying between these two hill ranges is occupied entirely by deep peat deposits, and intersected into numberless rills and streams. The usual signs of glaciation are well seen throughout the length of this valley. Moraines, perched blocks and striated rocks are numerous, and the geological evidence tells us that this district became the chief centre of ice dispersal for the South of Scotland during the severer phases of the glacial period.

In order to make a detailed study of the peat at different depths, sections or pits are sunk to the bottom of the peat. These sections are usually 8 to 12 feet long and 4 feet wide where the peat does not exceed 12 to 14 feet in depth. For greater depths the sections must be made much longer so as to allow a series of ledges to be left at the ends of the section on which the material from the deeper layers can be piled.

Two distinct forest beds are constantly found in the peat of this district. The upper is exposed along the sides of the peat bogs about 4 to 6 feet below the present surface of the







Fig. 3.—Denudation of the Peat in the Shetland Islands.

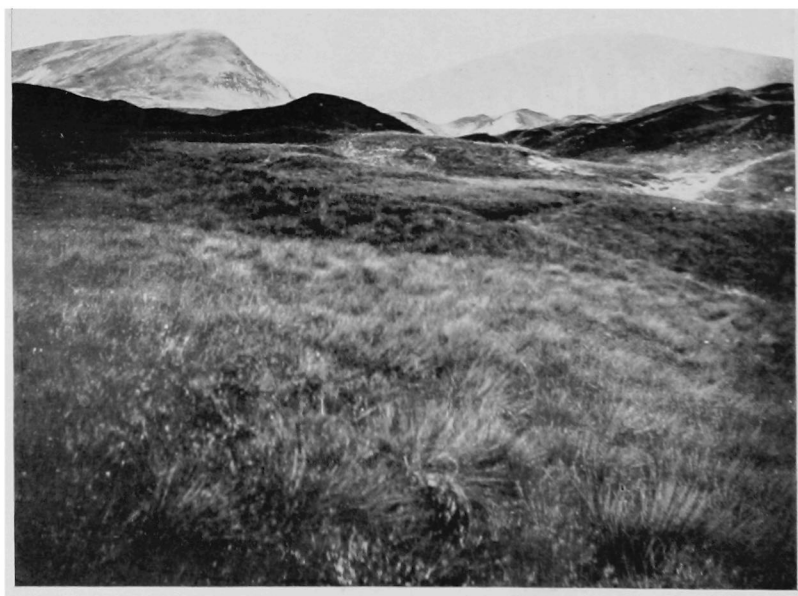


Fig. 4.—Moraines of the Valley Glaciers at the foot of Loch Skene,  
Tweedsmuir.

peat, but sections are necessary before the lower forest is seen. In fact it is possible to walk for miles through the peat hags in this district, and see the regular layer of large pine trunks and roots of the upper forest projecting from the sides of the banks.

A section taken near the Black Water of Dee shewed the following layers :—

1. Peat formed from the present vegetation.
2. *Scirpus* or *Sphagnum* peat (representing peat bog or wet moorland conditions).
3. Upper forest bed, consisting of *Pinus Silvestris*.
4. *Sphagnum* and *Eriophorum* beds.
5. Peat formed from the remains of arctic willows (*Salix reticulata* and *S. herbaceæ*) and *Empetrum* stems and seeds.
6. *Sphagnum* and *Eriophorum* beds.
7. Lower forest bed, consisting of birch, hazel, alder.
8. Structureless peat.
9. Sands, gravels and clays deposited by the valley glaciers.

Such being the sequence found in the trial section, others were taken along a series of intersecting lines drawn across the district, and the same features were found at every place. The peat bogs were then walked through, and one or two prominent strata (such as the arctic zone and the upper forest zone) traced along the sides of the banks. In this way one can be tolerably certain that the features noted are continuous over the whole district.

It is evident, then, that distinct changes in the general aspect of the vegetation have occurred since the peat began its growth. The structureless peat, resting upon the glacial deposits tells us nothing of the condition of things between the passing away of the valley glaciers and the lower forest period, but, as we shall see later, this hiatus is bridged by deposits containing well-preserved plant remains in the Shetland Islands.

At an early period, then, the valley was covered with thick woods of birch, hazel and alder, and the aspect of the country

must have been in striking contrast to its present bleak and treeless condition. At length, the lower forest passed away, for we find the peat immediately above to be entirely free from tree remains, and built up by plants characteristic of peat bog or wet moorland conditions. This is a change which, if only found over a small area, might not signify any climatic oscillation, but it becomes of great interest when we find that a similar change in the vegetation occurred about this time in the North of Scotland, the Hebrides and the Shetland Islands. This suggests that the replacement of forest by peat bog was actually due to climatic changes, and this view is rendered more probable by the fact that the plants indicating peat bog conditions are overlaid by the remains of an arctic vegetation.

This arctic plant bed marks a very different set of conditions to those implied by the presence of birch, hazel and alder in the lower forest bed. Similar vegetation, consisting of small creeping willows, occurs now only on the summits of the higher mountains of Northern Britain. Its presence here implies a climate some  $15^{\circ}$  to  $20^{\circ}$  F. colder than at present, marking a condition of things very similar to those now obtaining over high northern tundras, and we can hardly doubt that the climate in which this arctic vegetation flourished at 900 feet in the south-west of Scotland produced glaciation in many districts in the Highlands.

As we should expect, this arctic bed is not confined to the south-west of Scotland, for it has been traced through many districts in the Highlands, the Hebrides and the Shetland Islands. Peat formation, under these conditions, must have been very slow; still, cold conditions persisted for a sufficient length of time for about one foot of peat to be formed from an arctic vegetation.

As the peat above this horizon is examined, the creeping willow and *Empetrum* gradually disappear, and the peat is again built up of the remains of *Eriophorum* and *Sphagnum*—forming an upper peat bog.

Above this layer we meet with the upper buried forest,



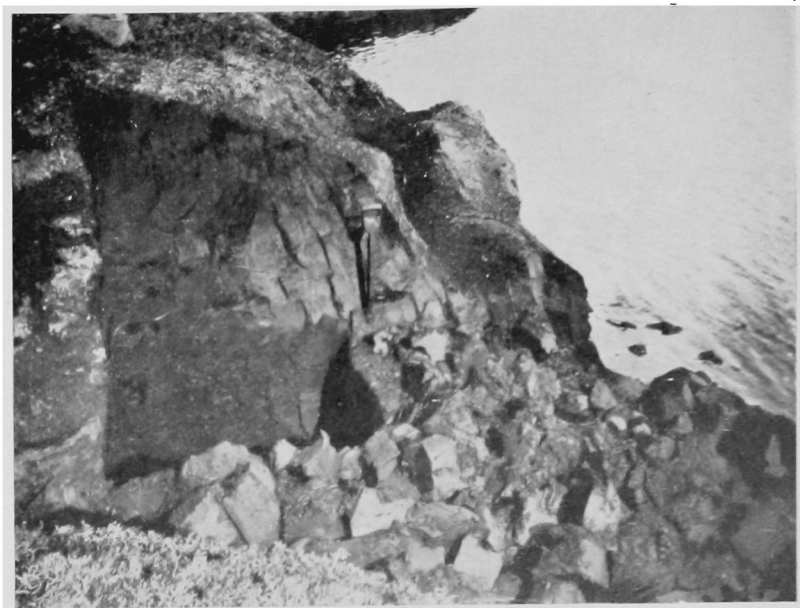


Fig. 5.—Section of 15 feet deep on the banks of Sma Loch, Shetland, Mainland.

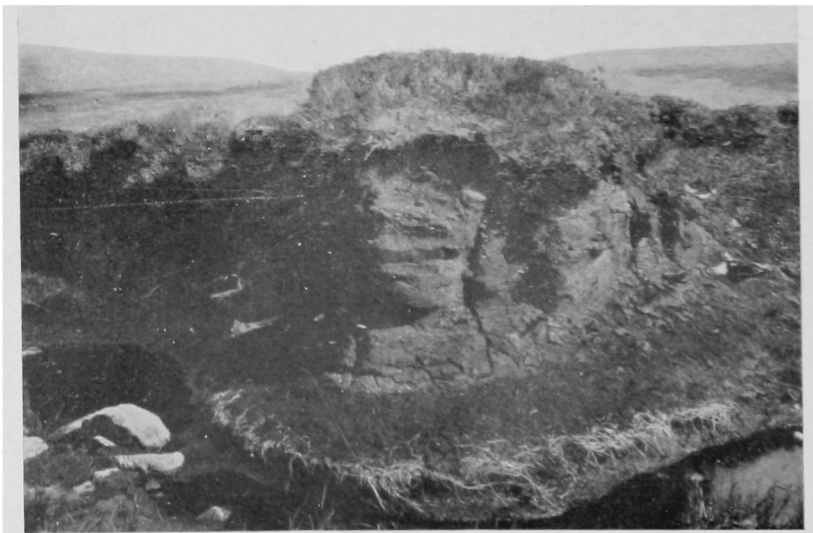


Fig. 6.—Peat Hags in the Merrick-Kells District, shewing the Upper Forest and underlying Arctic Plant bed, separated by Sphagnum Peat.



consisting of large trees of *Pinus sylvestris*. This upper buried forest (like the lower forest) was not confined to this district, for it has now been traced over the greater part of the peat-covered areas of Scotland.

The whole of the peat above the upper forest is formed from *Scirpus*, *Sphagnum*, *Eriophorum*, and *Calluna*, shewing that the area reverted from forest to peat bog.

Such, then, are the changes which have occurred during the formation of this peat :—

- (a) Recent peat. Moorland.
- (b) Upper buried forest.
- (c) Arctic plant bed.
- (d) Lower buried forest.
- (e) Structureless peat.
- (f) Deposits of the valley glaciers.

In Shetland the succession is particularly interesting, because it shews a similar succession of changes to the south of Scotland, only, arctic plants occur under the lower forest bed instead of structureless peat, such as we found in the Merrick-Kells district.

The peat in Shetland, then, gives the complete succession of changes since the valley glacier period. The hills and valleys in the centre and west of Shetland Mainland are covered with deep peat, channelled into peat bogs and covered with *Scirpus caepitosus*, *Eriophorum* and stunted *Calluna*. The hills nowhere attain a greater elevation than 900 to 1000 feet, and whilst the sandstone hills in the west are smooth and flowing in outline with few rock exposures, the quartzite hills farther eastward are rugged and shew many rock exposures. There is abundant evidence that these islands have undergone severe glacial conditions.

Resting upon the latest glacial deposits we find a layer of arctic vegetation below the lower buried forest. The remains belong to such plants as *Salix reticulata*, *S. herbaceæ*, *S. herbaceæ x Lapponum* and *Empetrum*. None of these Salices now occur in Shetland, their nearest station being on the summits of the higher mountains of Scotland, and their

presence here indicates severe conditions during the close of the valley glacier period. The peat in Shetland then furnishes us with the link which is missing in the South of Scotland, for the structureless peat there and the arctic plants in Shetland, both occur immediately under the lower forest and rest upon the deposits of the valley glaciers. In other respects the history of the peat is similar in the two districts, although, as we should expect, in areas so far apart there are some features present in the one district which are not found in the other.

In Shetland arctic plants again occur above the lower buried forest, but the upper forest of Scotland is missing in the northern isles. Evidently, the conditions at that time were favourable for the spread of forest over peat bogs in the South of Scotland but not in Shetland, and examination of large areas has shewn that the upper forest had a much more restricted distribution than the lower. The latter is present in all the peat mosses examined in Galloway, Tweedsmuir, on the basaltic plateau of northern Skye, in the Outer Hebrides, and in Shetland. The upper forest, although characteristic of the peat in the Southern Uplands and the Highlands, never makes its appearance in Skye, the Outer Hebrides or in Shetland. It disappears along a line drawn through mid-Caithness-shire, the head of Loch Eriboll to Rhiconich about 20 miles south of Cape Wrath.

Such a universal spread of forest over areas formerly occupied by peat bog implies Continental conditions, and there is reason to suppose that at such a time the area of the land was greater than when the districts were covered with peat bog. We have, at anyrate, two distinct forest periods in the peat, whilst the intervening strata indicate arctic conditions. The sequence just described is characteristic of large areas at moderate elevations above sea-level, but amongst mountainous ground in the Highlands only the later stages are present. Thus, one part of Rannoch Muir westward and northward of Loch Lydoch, the Spey-Findhorn watershed and the Findhorn-Nairn watershed in Inverness-shire, in Coire Bog amongst the





Fig. 7.—Upper Forest bed (*Pinus Sylvestris*) exposed by denudation of the overlying Peat.



Fig. 8.—Upper Forest bed (*Pinus Sylvestris*) in the Peat Hags on the Caithness-Sutherlandshire Border.

mountainous ground of Easter Ross, the Assynt district of N.W. Sutherland, the Parph near Cape Wrath, and over the whole of the 30 miles of bleak moorland northwards from Ben Griam Beg the basal layers of the peat contain the remains of an arctic vegetation. These basal layers are not overlaid by the lower forest as in the lowland districts of the South, the Hebrides and Shetlands, but by plants indicating wet moorland conditions, upon which rests the upper forest covered with recent peat.

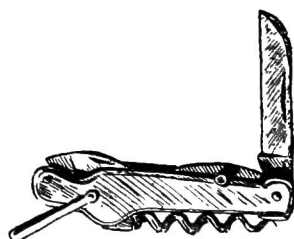
In other words, all the strata, lying below the intercalated arctic bed in the Lowlands, are wanting in the Highlands; We are then driven to conclude, either that the peat in the Highlands began its growth at a stage later than that in the South of Scotland, or, that the higher ground has been glaciated at a distinctly later date than the Lowlands.

The lower forest is generally composed of birch, hazel and alder; the upper, nearly always of very large close-set pine trees. The solid character of the upper forest remains may be inferred from the fact, that last July whilst examining the Caithness-Sutherland peat, sections were cut down through the 4 feet of surface peat when a solid layer of pine roots and trunks were met with. The latter really formed a solid wooden floor with only cracks of a foot or so between the trunks and roots. After trying vainly to cut through the massive trunks with a spade several other places were dug out near by in the hope of finding an open place in this old forest. As the opening was not forthcoming it was necessary to send back to the nearest place for an axe and saw, and next day, after several hours' work, one was able to cut through the forest and dig out the 8 or 9 feet of peat which lay below.

It is often possible to ascertain the general lie of the trunks. On the Caithness-Sutherland border the general lie is about W.  $30^{\circ}$  N., but occasionally they point almost east and west. The most frequent direction in the Highlands appears to be almost N.W. and S.E. This does not, of course, mean that the old forest was destroyed by wind, but simply that as the trees decayed they would finally be thinned out

and laid in the direction from which the strongest gales occurred.

The history recorded in the older peat mosses indicates a series of changes in the vegetation so great and extending over so wide an area that they must presumably have been caused by climatic changes. This view could hardly be advanced from an examination of the peat in one district, but as the largest peat areas from the Shetland Islands to Westmoreland and from Aberdeenshire to the Outer Hebrides have now been examined and the same general sequence found to prevail, there seems to be strong evidence in favour of this view. At anyrate, the change from birch, hazel, and alder forest to arctic tundra clearly indicates climatic change.





## NOTES ON THE ALPINE FLORA.

By H. STUART THOMPSON, F.L.S.

LET us not forget that under Rule I. of our Club, two of its objects are "to promote the advancement of Botany, Geology, Art and Natural History in relation to mountains, and to serve as a bond of union for all lovers of mountain climbing."

It surely cannot be denied that the beautiful flowers of the Alps do in themselves serve as a bond of union for all lovers of mountains, and for a large number of mountain climbers. How many people who visit the Alps, Norway or the Pyrenees, get intense pleasure from the Gentians, the Primulas, the Saxifrages, the Campanulas, even if they do not attempt to study them scientifically, and even if they rarely or never reach the snow line, or penetrate into glaciers. What could appeal more tenderly to any lover of Nature than his first sight of a Swiss meadow in June, full of Anemones and Orchids, or an Italian Alp bedecked with Gentians and Lilies, forming as it were a jewelled belt between the dark pines and the glorious mass of snow and ice beyond. To the climber also, flowers bring delight, whether he knows their names or no. They tend to make the early part of many a climb less dreary, and often when apparently all signs of animal life, save perhaps the occasional cry of a marmot, or the footprints of a chamois, are left below, he is still accompanied and cheered on his way by flowers so exquisite that he would fain stop and gather them.

On the Matterhorn ridge above the Hörnli, at 10,500 feet above the sea, I have gathered the purple and yellow *Linaria alpina*, the pretty little *Campanula Cenisia* with its large blue flowers, a plant which is peculiar to the Alps of Central

Europe; and also the white star-like flowers of *Cerastium alpinum*, which is found on many high mountains in Europe, Asia and N. America, and at lower elevations in Scotland, Westmoreland, Carnarvon, and in Arctic Scandinavia. At the Grands Mulets (10,000 feet) surrounded by the eternal ice and snows of Mont Blanc, I found *Saxifraga bryoides*, the beautiful little pink *Androsace glacialis* of the Primula family, together with two small plants allied to the Daisy, viz., *Erigeron alpinum* and *Chrysanthemum alpinum*. In ascending the Combin de Corbassière from the Val de Bagnes, I saw on the rocks at about 11,500 feet *Artemisia spicata* and the large yellow flowers of *Geum montanum*, one of the most handsome and widely spread of alpine plants; and from about 12,000 feet on the same peak, just 200 feet below the summit, I can shew specimens of *Senecio incanus*.

But examples could be given by climbers of flowering plants occurring at many points above 10,000 feet in the European Alps, though the number of species observed would certainly be small. In my own Herbarium\* there are about 77 species of flowering plants from above 8000 feet in the Alps, and these comprise 46 species from above 9000 feet, and 18 from above 10,000 feet. The Col du Crêt, above the Val de Bagnes, supplies at least 20 of the 77 kinds; and *Androsace glacialis* seems to be the plant most commonly found at the highest elevations, for I have it from eight different places above 9000 feet, between Mont Blanc and the Ortler. Apparently it does not descend the glaciers to the extent that *Ranunculus glacialis*, *Linaria alpina*, *Hutchinsia alpina*, and certain other plants do.

John Ball tells us in the introduction to the *Alpine Guide*, that flowering plants have been found [in Europe] at a height of 11,000 feet, and even above 12,000 feet; and elsewhere he says that on some rocks at the side of the great Aletsch Glacier in the Bernese Oberland, at a height of 10,700 feet, or

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\* Owing to the fact that in the Herbaria at Kew and at South Kensington comparatively few of the alpine plants from Europe have altitudes added to the labels, my remarks here must be confined to my own experience.

nearly 2000 feet above the much talked of "Jardin" near Chamonix, he actually gathered over 40 species in flower, one being the common Thyme and another a variety of the common Dandelion.

Let us now say a few words about the characteristics of alpine plants, and those who are interested cannot do better than read the excellent *Additional Notes* of Mr. Percy Groom, M.A., in Mr. Coolidge's delightful *Hints and Notes for Travellers in the Alps*, a little book which no intelligent person should go to Switzerland without having read. At high altitudes there is such a short active season (June to September) that plants have to produce flowers and mature their seeds rapidly. To help them, as Mr. Groom points out, many have well developed subterranean stems or thick roots, in which they store food during winter, so that at the commencement of the active season, the reserve stock of food may be at once available for the rapid production of new leaves and flowers. The active vegetative season at different altitudes has been found to run parallel with the mean monthly temperature, and the rate at which the snow line ascends. For example, on the Théodule Pass (10,900 feet), the mean monthly temperature of the air does not reach as high as freezing point till June, but remains above that point during the next three months, and sinks below it again in October. At a temperature below freezing point the great majority of alpine plants are incapable of any vegetative activity; they must therefore rest during the long season when the temperature is very low and the ground is covered with snow. Such plants as *Anemone vernalis*, *Ranunculus alpestris*, *Soldanella alpina* and *pusilla*, and *Crocus vernus* are exceptions, and push out their flowers just at the snow line in the melting snow.

Annuals are very scarce in the Alps, for the shortness of the alpine summer would render their continued existence precarious, and one particularly severe season by preventing the ripening of seed would threaten an annual species with extermination. Kerner states that on the Danube plains there

are 56 annuals and 44 perennials in every 100 plants, whereas in the Alps only 4% are annuals.

To quote Mr. Groom, "The most striking danger appears to be loss of too much water by excessive transpiration. Intense isolation, the frequent dryness of the air, and its low pressure all unite in inducing rapid transpiration. During the day-time, however, the intense isolation, in as much as it warms the soil to a temperature considerably above that of the air, at the same time promotes absorption by the roots. At night-time intense radiation cools the soil to such a degree as to retard, or quite stop, absorption of water from the soil, and a plant itself is almost equally cooled, but the air is not. Hence, at night-time, the plant is doubly in danger of being dried up, owing to the fact that conditions causing the slowing of the absorption of water are not counterbalanced by external influences initiating an equivalent retardation of its exhalation of aqueous vapour. These considerations, together with the necessity of having a proper proportion between transpiration and the absorption of carbonic acid by the leaves, give the clue to the structure of many of the alpine plants."

First, an extensive development of the subterranean parts is very characteristic, in that a large surface is employed for absorbing nutritive matter and water from the soil—*e.g.*, Primulas, and many Saxifrages and Androsaces. Alpine plants are usually of low stature, often forming little mats or tufts or even hemispherical cushions with close-set small leaves, *e.g.*, *Androsace helvetica*, *Silene acaulis*, *Draba azoides* and several saxifrages. If not in mats, often the leaves are arranged in rosettes, pressed against the ground as in *Saxifraga cuneifolia*, *Ramondia*, etc. This diminishes transpiration by exposing less of the leaf surface to the air, and by tending to the accumulation of moisture between the leaves. Transpiration is often further hindered by a copious development of hairs, as in Edelweiss; by succulence, in relatively decreasing the surface in comparison with the volume as in *Sedum* and *Sempervivum*; or by the stiff leathery nature of the leaves, which are then clothed with a

more impermeable membrane as in *Thlaspi rotundifolium*, which grows so well on both sides of the Théodule Pass. Whereas alpine plants in exposed situations have generally leathery or hairy leaves, we find more delicate leaves in similar plants growing in sheltered ravines, beds of torrents, etc.

Another very obvious characteristic is the abundance of blossom, on generally quite a small plant—e.g., various Potentillas, Geums, Gentians, Primulas, etc.; but it is a mistake to suppose that the flowers of alpine plants are larger than those of their affinity in the plains. This illusion is due to the frequent dense crowding of the flowers, often forming bright patches on the ground, and to the greater depth of colour.

The great brilliancy in colour of the flowers is to a certain extent caused by the alpine conditions, and it is well-known that the colours and shades of many alpine flowers change under cultivation in gardens. As we ascend the mountains the light blue of the gentians and forget-me-not becomes deeper, and the yellow of the Hawkweeds and Senecios tends towards orange. The yellow cowslips and primroses of the lowlands give place to the more highly organised Primulas of pink and violet hues. The white and yellow Saxifrages of the lower mountains are supplemented by the bright rose flowers of the *Saxifraga oppositifolia* and the purple madder blossoms of the *Saxifraga biflora*. There are, as every one knows, many species of *Campanula*, *Gentiana*, *Phyteuma*, *Veronica*, etc., with flowers of violet, sapphire or deep ultramarine hues. Alpine flowers often have stronger scents and more honey than their lowland allies. Their colour and scent must be partly attributed to the action of the environment on the individual plants, and partly to the selecting influence on the race exerted by insects.

In ascending the Alps from the region of the olive or the vine to that of perpetual snow we find, as every traveller knows, a continuous change in the vegetation, and botanists have distinguished various successive zones corresponding to these changes. For our purpose it will be enough to take account of *three* well-marked divisions as adopted by the late

John Ball in his learned paper *On the Origin of the flora of the European Alps* (*Proc. Royal Geograph. Soc.*, Sept., 1879), viz.,

A lower zone extending up to the limit of deciduous trees ;

An upper zone, including the higher pine forests and alpine pastures ;

And a glacial region, where patches of snow remain through the summer and only a part of the surface is cleared for two or three months.

It may be observed that in his introduction to the *Alpine Guide*, Ball divided his "upper zone" into a Subalpine Region, or Region of Coniferous Trees, and an Alpine Region.

The Natural Orders or Families specially characteristic of *all* mountain regions are those which derive their name from the Rose, the Ranunculus, the Saxifrage (except in New Zealand and S. Australia), the Primula, the Campanula and the Gentian ; and, in the Alps, Compositæ, Leguminosæ, Cruciferæ and Caryophyllaceæ are still more strongly represented. Twenty-seven years ago, John Ball, F.R.S., the first President of the Alpine Club and Editor of the famous *Alpine Guide*, enumerated 2345 species of flowering plants in the whole region, divided into 523 genera and 96 Families. For the sake of simplification, 335 plants he called sub-species, we prefer to call species, and mere varieties are excluded by both of us. Of these 96 Families, there are no less than 36 not represented at all in the "upper" zone.

Ball arranged in two tables the Families with genera and species most common in the Alps. First for the alpine flora in general, and secondly in the "upper" zone of the Alps. Compositæ heads both the lists with 310 and 175 species respectively. The first 6 Families of the "upper" zone are:—

	No. of Genera.	Species.
Compositæ (Daisies, Thistles, etc.) -	38	175
Cruciferæ (Cress, Wallflower, etc.) -	17	85
Caryophyllaceæ (Pinks, Arenaria, etc.)	10	81
Leguminosæ (Peas and Vetches, etc.)	15	78
Gramineæ (Grasses) - - -	16	72
Cyperaceæ (Sedges) - - -	5	67



Then follow Scrophulariaceæ (Linarias, Veronicas, etc.), Rosaceæ, Umbelliferæ, Ranunculaceæ, Labiatæ, Saxifrageæ, Campanulaceæ, Primulaceæ, Gentianaceæ, Orchidaceæ, etc., etc.

Although these zones of vegetation are generally well-marked and fairly constant, occasionally one comes across facts in connection with latitude which are difficult to understand. For example, in the Eastern Pyrenees (N. side), certain well-known high-mountain plants such as *Lychnis alpina* and *Azalea procumbens* thrive at as low elevations as they do in the colder latitude of the Swiss Alps. On the South side of Mte. Toraggio in the Maritime Alps, on June 19th of this year, *Gentiana verna* and *G. excisa* (the large blue one often wrongly called *G. acaulis*) and *Anemone alpina* were found at only just above 5000 feet, which is certainly no higher than they are generally found in Switzerland in June.

Monte Toraggio, though only about 6400 feet high, is one of the noblest and most beautifully proportioned mountains. From Pigna, where there is a comfortable Inn, 1000 feet above Bordighera, the ascent of Toraggio makes an easy and very interesting excursion, and the cliffs at the top would doubtless afford good ground for some of the athletes of this Club. The wooded valleys on the South side remind one of the Combes of Exmoor or the Quantock Hills, but they are much deeper and more extensive, and of course the vegetation is different. On Toraggio the top limit of Olive trees is about 1800 feet, then a beautiful belt of Spanish Chestnuts extends to 3000 feet where Pines begin, and at 5000 feet are the highest meadows, as flowery as any in Switzerland, but with a rather more southern flora. The Chestnut zone in the Maritime and Ligurian Alps probably has the most varied flora, for there many plants of the very distinct Mediterranean group are found growing side by side with those which have descended from the higher mountains, in addition to a large number which are only to be found in this particular zone.

Whereas on the south side of Monte Toraggio in latitude 44° the pines extended from 3000 feet to about 5000 feet, on

Cambras d'Aze, on the N. side of the Eastern Pyrenees, my pocket aneroid indicated a belt of pines 1200 feet in vertical height, from about 5500 to 6700 feet above the sea, although only about  $1\frac{1}{2}$  degree further South, and in spite of the fact that my notes were taken on the N. side of the Pyrenean watershed.

In the Eastern Pyrenees the most prevalent Conifers are *Pinus Austriaca*, *P. picea* and *Abies pectinata* (Silver Fir). In the Swiss Alps the Spruce (*Picea excelsa*) and the Silver Fir reach nearly 6000 feet, or some 600 feet higher on the South side, and they leave the Scotch Pine far below. The Larch, in granitic regions, and the Siberian or Arolla Pine (*Pinus cembra*) often surpass the level of 7000 feet in the Alps.

In Norway the planes of vegetation of the Scotch Pine and Birch run nearly parallel with the plane of perpetual snow, which at latitude  $68^{\circ}$  is something over 3000 feet above the sea according to the distance from the West coast, where the effect of the Gulf Stream is felt. The Spruce Fir in Norway scarcely passes the arctic circle, but the Scotch Pine reaches to the North Cape, 300 miles within the arctic circle.

It is to be regretted that the late Mr. Ball did not live long enough to thoroughly complete his work, and to prove some of his theories on the vexed question of the origin of the alpine flora, for no man knew more of the subject. He gave the geographical distribution of every flowering plant found in the Alps in another long and valuable paper now at Kew, a transcript from which was published, with an introduction by Sir Wm. Thiselton-Dyer, in the *Trans.* of the Linnean Society (Bot. V, 1896), entitled *The distribution of plants on the South side of the Alps*. He worked out the detailed distribution of the alpine flora for 50 districts on the same principle as that adopted by Hewett Cottrell Watson for the flora of Great Britain in his *Cybele Britannica*. H. C. Watson devoted a long life to the object of ascertaining the distribution of our British plants in Great Britain, and in addition to dividing the British flora into 8 more or less distinct types, according to the area or country where they are most

abundant, he adopted two distinct Regions or Areas of *vertical* height—the Arctic and the Agrarian Region. After investigating the heights at which plants ascend in the Scotch mountains he found that corn may be cultivated to about 1000 or 1200 feet in the Grampians, and that the Bracken fern grows to this height. The area above this limit he termed the Arctic—below the Agrarian Region. Each of these again he sub-divided into three by plants which may be conveniently used as demarcations, thus :—

#### ARCTIC REGION.

- I. Super-arctic zone contains *Salix herbacea* (Dwarf Willow) but no Ling (*Calluna*).
- II. Mid-arctic zone contains Ling but no *Erica*.
- III. Infer-arctic zone contains *Erica tetralix* (Cross-leaved Heath) but no Brake fern.

But we must turn once more to the Alps.

Although he differed in detail as to the way in which the results were brought about, M. Alphonse de Candolle, the famous botanist of Geneva, agreed with Ball that there is an element of great antiquity in the alpine flora, which cannot be simply accounted for on the hypothesis of a migration from the North during the glacial period. De Candolle pointed out that some of the most ancient fragments of the alpine flora, species of *Primula*, *Pedicularis* and *Oxytropis*, are now to be found only on the southern slopes of the Alps, and neither in the interior of Switzerland nor in the North of Europe. And, again, the alpine species of *Campanula* peculiar to Mt. Cenis, the Simplon and adjacent valleys (*e.g.*, *C. Cenisia*) are not related to arctic species but to species of mountain chains to the eastward.

Sir Wm. Thiselton-Dyer has said that “the alpine flora is certainly very ancient, but it is scarcely possible to doubt that it is a survivor, and as De Candolle points out, probably a decaying survivor of one of which the extension was at some former time far more considerable.” He considered a mountain flora to be “essentially a flora of refuge, and an

island flora is the fact in geographical distribution with which it best admits of comparison."

Ball was somewhat inclined to minimise the effect of the glacial period, but he considered it lowered the vertical height of the zones of vegetation by from 1000 to 2000 feet, for even during the period of greatest cold the highest ridges of the Alps were not completely covered with snow and ice.

De Candolle, on the other hand, thought that a large element was driven South, and subsequently regained its footing only on the southern face. Thiselton-Dyer thinks De Candolle's views as to why certain districts of the Alps possess a far more varied vegetation than others almost convincing, (*Nature*, Ap. 27th, 1876), and he thinks the best guide to the results are found in the paper by De Candolle, communicated to the International Botanical Congress at Florence, in 1874, *Sur les causes de l'inégale distribution des plantes rares sur la chaîne des Alpes*.

Dr. H. Christ, of Bâle, also studied this question carefully, and he published in 1879 *La Flore de la Suisse et ses Origines*, though the edition of that year was actually in German. He agreed with Ball in putting the number of plants endemic in the Alps at about 180.

We find much more difference between the flora of the Alps and Pyrenees than between that of the Alps and Carpathians. Whereas the Alps have about 180 endemic species and at least 15 genera not found in the Pyrenees, the Pyrenees have something over 100 endemic species with only 6 or 7 genera not found in the Alps. The beautiful *Ramondia* of our rock-gardens is one of those genera, but it is found in Servia and Thessaly as well as in the Pyrenees. The exquisite Pyrenean Gentian of a violet hue, whose corolla is divided into 10 lobes, each alternate lobe being beautifully fringed, is also found in the Carpathians and in Asia Minor, and it is an example of many species common to the Pyrenees, Carpathians and Asia Minor, but wanting in the intermediate districts. At the present time the Alps are separated from the higher points of the Carpathians and from the Pyrenees

by only about 200 miles of comparatively low country, but during the Middle Tertiary period and perhaps again they were separated by arms of the sea, which changed Europe into an Archipelago.

"With very few exceptions," says Ball, "all the mountains known to possess rich and varied floras, with many endemic species, are portions of ancient continental masses that have been at various periods isolated, but never totally submerged. This holds true of the Pyrenees, the Carpathians, the mountains of the Balkan Peninsula and Greece, and of the Caucasus; while the two regions possessing the richest known mountain floras, Spain and Asia Minor, were for long periods Archipelagos whereon the ancient flora was preserved, but subjected on separate islands to much specific modification."

"It is very remarkable that when we compare the alpine flora with those of other mountain regions not immediately adjoining, we find the closest affinity to be with the mountains of Northern Asia, notwithstanding the vast interval of space that divides them and the wide differences in their climatical conditions. Fully one-fourth of the species of the alpine flora are present in the Altai region, as also are five-sixths of the genera. This is the more noteworthy, as we have in the Caucasus, at a third of the distance that divides the Altai, a great mountain mass with a rich alpine flora and enjoying a much more favourable climate, where the proportion of species common to the Alps is much smaller. You may reckon that out of every twelve alpine species three are to be found in the Altai, and only two in the Caucasus."

On this subject Ball's final conclusions were—of alpine species 17% are common to the arctic flora, and 25% are common to the Altai region; while the arctic flora has 40% common to the Alps, and 50% common to the Altai, using this as a collective name for the ranges of Northern Asia.

Accompanying Mr. Watson's interesting paper on *Mountaineering in the Southern Alps of Japan* (Alpine Journal, Feb., 1906), are lists of plants found by him at various heights up to 10,000 feet, a large number of which we find in central

and western Europe; and it is noteworthy that the highest list comprises 6 plants we get in Britain, viz., *Carex montana*, which grows in Sussex and in the West of England, *Luzula campestris* (very common in England), *Sedum Rhodiola*, *Vaccinium Vitis idæa* (Cowberry), *Pinguicula vulgaris* (Butterwort), and the delicate *Linnea borealis*, so common in parts of Norway and Scotland.

There is much yet to be learnt about the distribution of some of the high mountain plants, and there is not a member of this Club who may not add something to our store of knowledge if he will but put in his pocket-book a few scraps of flowers, which he may notice in his climbing expeditions, together with notes on altitude, locality, &c.

In 1879 Ball wrote—"For the glacial region I shall not attempt to give you accurate figures, for the simple reason that sufficient materials do not exist." To-day we are not much better off.

The most useful book on the flora of the Alps is Coste's *Flore de la France, de la Corse et des contrées limitrophes*, containing over 4000 small but excellent woodcuts, and a good concise description of each species, together with keys, etc. The three large volumes cost about 50s. This book is practically a work on the flora of Western Europe, including, of course, the British Isles. An excellent little book on the cultivation of Alpine Plants was compiled by Mr. W. A. Clark when foreman of the Alpine Department of the famous York gardens of Jas. Backhouse & Son, Ltd.

## THE HELM WIND.

(By permission of the *Manchester Guardian*.)

THE casual visitor to Ullswater may wake up some bright morning to see its usually placid or reasonably placid surface is violently uneasy. If he be an ordinary mortal he will be wise to stay under roof-bield; if he be equipped with pluck, endurance, and, perhaps, a powerful motor, it will be instructive for him to make his way eastwards to the Pennines. For the first score or so of miles he will be subjected to the buffeting of a gale—not a self-respecting wind that sweeps along the earth surface and merely blows off hats and puts out matches, but a mad wind that comes down from above and is particularly disturbing. Then suddenly he will pass into a Valley of Aylon, where the wind blows softly and from the west—the gale was bearing down from the east. “Fair laughs the morn, and soft the zephyr blows,” and wafts him gently onwards to within three or four miles of Crossfell, the summit of the Pennines. Then succeeds a dead calm, resonant with the tumult of a hurricane. Eastward the tourist goes, on foot now, through the breathless air, yet with the voice of the tempest growing momentarily louder, till as he breasts the lower slopes of Crossfell he will be chilled and checked by a powerful, cold blast. It may be that he will take shelter on his back. Be that as it may, the sky under such conditions is worth the contemplation. To the east is a massive belt of clouds resting on or almost touching the summits of the Pennines. Then comes an interspace of absolutely clear sky, and then a heavy bar of vapour on the same level as the cloud-capped towers of the eastern fells. At first sight this bar appears motionless, as indeed it is in respect of direction, but closer observation will show that it is agog throughout with the most tumultuous agitation. To the west, again, the

sky may be either clear or overcast, but across the open space between the Pennines and the cloud-bar little shreds of vapour are continually breaking away from the eastward, only to be driven back and dispersed.

Such is the Helm Wind. It takes its name from the helm, or helmet, of clouds that crowns the fells. The explanation of the phenomenon is reasonably simple. The dales of Lakeland are in the summer a region of prevailing westerly airs, rare beauty, no cold (except when a Helm Wind is blowing), sunshine and rain, plenty of warmth, and quite enough stuffiness. Between them and the Pennines lies the Eden Valley, in which the conditions, with certain modifications, are similar. Eastward of Crossfell, however, the character of the land changes, and you have mile after mile of bleak moors. Over these blow the airs from the German Ocean, rapidly cooling as they go, the moisture they contain shrinking into thick vapour under the chilliness of their reception, till they reach the descent where Crossfell falls steeply to the inviting valley below. Down the slope they tear with a yell, picking up every available scrap of moisture in their course, to be flung back high into the air by the mere violence of their impact on the earth. And now happens something curious. The violent uprush caused by the rebound not only carries with it all the moisture the wind has gathered in its course beyond the Pennines, which accounts for the cloudless space between the fells and the tossing cloud-belt, but creates an upward draught sufficiently strong to suck up with it the humid westerly zephyrs. Between the rebound of the Helm Wind and the subordinate up-draught of the zephyrs there is obviously no possibility of wind at all, and here you have a region of dead calm. Now, when the moisture has reached the higher and colder strata of the air it of course condenses, thus forming the cloud-belt, or Helm Bar. Its immobility of position and constant agitation are attributable to the fact that the Helm Wind keeps trying to blow away a mass that it is constantly, with the aid of the zephyrs and chance scraps of cloud from the helm itself, creating. As it is, the Helm Bar continues an



impassable barrier until the atmospheric conditions have rearranged themselves and become normal. Thus checked and deflected by the Helm Bar, the wind escapes horizontally westwards till it reaches the Lakes, when it is attracted downwards to take the place of the warmer air, and down it comes.

The fury of the Helm Wind in full blast is extreme. The following description by the author of "*Highways and Byways in the Lake District*" is as accurate as it is graphic:—

The whole surface of Rydal Lake was entirely hidden beneath clouds of driving spray. The agitation of the actual surface was, of course, great, but that was quite a secondary matter; for it seemed as if the gale in its violent and spasmodic rushes scooped up tons of water into the air and then dashed them with headlong force across the lake from shore to shore. The brightness of the sky, the brilliancy of the sunshine the blueness of the lake immensely heightened the effect. Sometimes the whirling masses of water were flung in showers back to their element like the play of some vast fountain, flashing rainbow colours in the sunshine as they fell; at other times these great spray clouds were driven high over the banks and scattered far and wide amid the woods behind.

Besides being violent, the Helm Wind is abominably chilly. It may last for one day, for three or nine, and on the occasion of a nine days' visit winter clothing, even in bright sunshine, is desirable for some time before it takes its departure. Occasionally its fury is so great that the steamer traffic on Ullswater has to be suspended. In fact, to the dalesman the Helm Wind is an unmitigated nuisance.

The switchback character of the wind is complete. There is the long ascent to Crossfell from the German Ocean, the sudden drop to the Eden Valley, the upspring to the Helm Bar, and the final descent to the Lake District. Of course, Crossfell has not the monopoly of the switchback winds of the world. Perhaps the most famous of them is that which, when the tablecloth is laid, tears down Table Mountain, filling its precipices with dust and tumult, springs violently skywards, to rush down in wrath and clangour on the shipping in Table Bay.

## THE CHEESE-MAKER.

By J. W. R.

AT five o'clock on a gray, still morning, we started out from Arolla to climb the Petite Dent de Veisivi. Other two, weather-wise, or more likely, bed-drawn, stayed behind. Low clouds and an oppressive warmth promised badly for the day's weather, and the hour's walk down to Gouille gave time for these evil promises to fulfil themselves in a light drizzle. Still, in Switzerland, and at early morning, no climber who means business is turned back by a little rain, and so we walked up the steep wooded and grass slopes towards the Col de Zarmine. The rain held off until we had reached the rocks leading to the south end of the ridge where the climbing begins, but at that point it suddenly descended in torrents. A flat boulder sheltered two of us from the rain, but not from streams of water which trickled at first, and soon poured over the boulder. Cold, wet and uncomfortable we lay on our backs for an hour, hoping for blue sky, or at least a return to light drizzle. But instead, the downpour increased, and—our patience exhausted—we ran, slithered, leapt down the track to the Alp Zarmine 1000 feet below.

Here the water ran through the soft pastures in a hundred directions, and everywhere the feet sank to the boot tops in watery ground. The clouds hung round us on the hill sides, and the rain beat pitilessly. We could hear the tinkling of the cow bells, but could not see either the cattle or the herdman. Wet to the skin, we reached a squalid looking structure, low, with sloping roof, and walled with piles of loose stones. Before the wicket door, the pigs, small, thin and active to an Englishman's eye, grunted and wallowed in the mire. The

heavy clouds again enveloped us, and the rain became tropical in volume. Shelter was imperative.

Entering the hovel—for it was neither chalet nor Sennhütte in build—we found an old man just rising from his sleeping place. This consisted of layers of brown sacking on a heap of flat stones. The light came through the upper portion of the doorway, but light, rain and wind also came freely between the wall stones. In the left hand corner were three stony looking pieces of black bread, apparently the only food in the place which was not supplied by the cows.

Over a wood fire there was suspended a huge caldron, three and a half feet deep, half filled with milk. Cheese-tasters, spoons, ladles and spits, all of wood, were hung on or rested above the rough timber beams supporting the roof. On the left was a wooden trough formed by a roughly hollowed out pine trunk. On the edge of the trough a closed wooden box eighteen inches high and about eight inches square stood, a green liquid trickling from its lower end into the half filled trough.

Our guide, who was acquainted with the old peasant, soon made what explanations were necessary for our intrusion, and we were invited to come to the fire. More fuel was added, and a log drawn near for a seat. Our provisions furnished a welcome meal, and the food and warmth soon removed our grumpiness. Conversation at length turned to the subject of cheese making. Our own Gruyere had by this time been eaten in deliciously toasted morsels; and the old man, when the milk in the cauldron was sufficiently hot, began to stir it with a wooden ladle. After a while, he drew some liquid from a small wooden cask, and threw it into the cauldron. Coagulation began immediately, and the beautiful seracs formed on the surface. These were skimmed off with one of the wooden spoons, and put into the square box, and left to drain. The cauldron was swung round on the rude wooden hook away from the fire, and the whey poured into the trough.

Of course, we tasted the curds, and found them delicious. After eating about half a pound, we were advised, for our own

sakes, to stop, The old man told us that his curding was done by a decoction known only to him, which was made from herbs. He did not volunteer further details, but it is probable that thistle tops or artichoke flowers enter into its composition. The English rennet is not used in the making of Gruyere on these mountain pastures.

Early in July, on the same day of the month in each year, the cattle are taken up to the higher pastures. Here, in the rough stone huts, the herdsmen live till the end of September, moving the cows over the pasture, milking them and making cheeses. These are the real "alps," and mountaineers coming down from their climbs love to hear the carolling of the herdboy on the hillside, knowing well that the chalets below will furnish them with draughts of rich milk, delicious but seductive. To the wise a little is sufficient.

Two cheeses a day of about 16 lbs. each, are the output of the Alp Zarmine. The number of cows is about 50. Swiss cheeses are either "gras" or "maigre;" the one is made from the milk with its animal fat, the other from skim milk.

The old cheese-maker was with difficulty persuaded to accept some of our white bread, and after a two hours' stay in the hut, during which time our clothes had dried a little, we took our leave. The weather was still bad, and the hillside had now become a mass of slippery mud.

Through the swirling cloud and the heavy rain came the song of the herdboy high up on the hillside. He was in the pouring rain, earning about 4d. a day, and still sang! We ran down to Arolla, discussing contentment, and certainly having profited something. As for the Petite Dent de Veisivi, we revisited it two days later, and having finished the climb in fine weather we descended the Alp Zarmine. Passing it, we waved a last good-bye to the old cheese-maker, and from far above on the hillside the clear shrill song of the herdboy was carried down to us, accompanied by the music of the cow bells, this time sounding the merrier because of the sunshine.

## KYNDWR CLUB NOTES.

IT was on Saturday eve, in the gorgeous, bright October,  
Then when birches are changed, and heather blooms are faded,  
And amid russet of heather and fern green trees are bonny.

CLOUGH.

NO season gives a richer glory to the rocks and heather of the High Peak than a fine day in October. From Edale Station we looked right up the furthest reaches of Grindsbrook, deep into the heart of Kinder. The swart cliffs on the summit edges, Nether Tor and Upper Tor, and the crags through which the Grindsbrook breaks down in cascades from the great peat moss, seemed a mere stone's throw away—the air was so pellucid. Behind was a sky as bright as May-time, ravishing depths of pure, luminous blue. The heather was dead or dying, but a delicate purple bloomed over it in the mass, as beautiful as the splendours of August. And, surely, the hoary dead grass was more pleasing to the eye than the toneless green of summer. Gorgeous stretches of smouldering bracken rivalled the intense russet of the beech woods in the dale.

We had doubts as to the exact limits covered by our permit, and accordingly thought it prudent to leave the dale for the fellside unobtrusively. Instead of striking up the Nab from Edale Chapel or following the cart-track into Grindsbrook Clough, we skirted the slopes for half a mile till we came to a minor clough just east of the Nab and its towering gable, Ringing Rocher. Here a deep-cut trench carries a foot-track straight uphill, and we speedily found ourselves mounting beside a brooklet, with rocks and trees enough about us to blur our figures to a distant spectator. At 1,500 ft., we rested in the music of a tiny waterfall, and then took to the turf

ground behind a wall running Kinderwards. It brought us out on the edge beside a rocky knoll overlooking the whole of Edale, with other dales beyond, and far horizons of tossing hill-crests east, west, and south. A smoke column in the south-east looked so near that we took it to be a heath fire on Froggat; but we soon perceived, by studying the lie of the country, that it could not be anything nearer than the coal-mines and furnaces of Chesterfield. The Derwent valley was traceable for miles between the clean-cut edges, and over the interposing hills we peeped into the dales of the Wyc.

Not only was the air marvellously clear, it was strangely and abnormally penetrable to sound. The shouts of men and boys playing football in Edale, a thousand feet beneath us and a mile away, came up with a distinctness that was quite uncanny. They were echoed from the rocks a few yards away, and we looked round to see if there was not someone there engaged in an excited altercation with himself. It may have been an omen. Leaving the knoll, we had not gone a hundred yards before we walked right into the arms of a keeper. It turned out that we had overwalked the bounds vaguely prescribed by our permit, and according to his statements must have scared a hundred birds, though we had seen never a one. He was perfectly civil, however, although he thought it very foolish of us to climb Kinder Scout in order to reach the Snake, when we could have got there so much more easily by the road.

We soon crested the ridge between Edale Edge and Seal Edge; the wild Ashop Valley lay beneath us, with the wilder cloughs beyond that bring the Derwent's tributaries down from the mountains of peat-moss about Bleaklow Head. From our feet great buttresses plunged into the depths of the valley, with shadowy cloughs beside them, at the bottom of which, far, far away, we could see the sparkle of streams and waterfalls. But up here there was absolutely nothing to drink, and if we continued along the Edge it might be an hour ere we should come to anything potable. The smoker lit his pipe, arguing that tobacco was an ample substitute for liquid. Two

miles away, but, as it seemed, right beneath us, the white walls of the Snake Inn showed comfortably against the russet hill-sides. The invitation could not be resisted. We started downhill, bearing toward the nearest water, which happened to be glittering refreshingly in the bottom of Black Dean Clough, right underneath our halting place. A scramble down the rocks in a dry stream-bed was followed by an attempt to run down the brake-covered slopes, resulting in slips and slides and the sudden collapse of two of the party. Up again, we pursued our headlong course down to the shaly cliffs that overhung the water, and there met the Black Dean Brook coming in full strength from the deeper branch of the clough.

Brown and silver birches, rich red mountain ash, and dense thickets of bracken that looked more like coppice than brake hemmed in the beautiful bed of the brook, which ran in silver over mosses as green and lustrous as malachite. To save a circuit we kept away from the bridge over Ashop, and, striking the river higher up, had to struggle across, from stone to stone. The spot was marked by a boundary, and we used the three wires to support us over the longest strides, fearing all the while that the frail threads would drop us into the eddying scours. Evening was upon us as we walked up the last mile to the Snake. The sky was rosy; there was a whole firmament of light overhead; but the vast sombre masses of the Kinder buttresses were like the pillars of a realm of night. The deep brown face of the moor seemed to radiate darkness, itself growing darker and darker, until the whole vast fell, with its rocks and black heather tracts and its profound ravines, was nothing but many gradations in a vortex of gloom.

Our party, in the course of the next hour or two, was augmented by fresh arrivals, until we attained the happy number of a round dozen. We dined and drank each other's health, and finished up by drinking success to the Access to Mountains Bill, which we hoped would one day free the mountains of Derbyshire, as well as those of Scotland, from the iron rule of the gamekeeper, so far at least as concerns

the rambler and the climber. It was after midnight when we went to bed, and by then a perfect moon was shining in a sky of absolute purity. No longer dark and gloomy, the sides of Kinder were transfigured and spiritualised, shining with a pearly lustre, slope beyond slope growing more and more ethereal up to the ghostly sky-line of the Edges. The Ashop and the Fairbrook were twisting the moonbeams into chains of silver; the deep and rugged cloughs brimful of moonlit haze; whilst overhead the great orb, no longer a flat disc, as it appears to us in town, shining with reflected beams like a phantom sun, swung in the blue infinity as a globe of light; and the star that watched its progress really seemed, as it really is, a far more distant point of light in the unfathomable depths beyond.

Next morning, our destination was the Alport valley, which we reached by a short cut across the intervening moorland. From the top, we looked back again towards Kinder's brooding majesty, and the proud rock-crowned headland of Fairbrook Naze, striding forth from the shadows. On this side of Ashop, the beeches, the rowans and dwarf oaks in dale and clough blazed with sunshine, and the illimitable expanses of withered bracken were not less gorgeous in their October colouring. The eye was led on and on by exquisite gradations of tint, blended together in subtle harmonies, to the remote heights of the Glossop moors and the league-long horizon of Bleaklow, the northern culmination of the Peak; and again southwards to the blue hills beyond Bamford and Castleton. An ancient landslip has carried the old hill-crest down some hundreds of feet, leaving a deep wound behind, still bearing witness to the violence of the disaster with its heaps of scattered fragments. But the next half-mile brought into view a grander example of a similar catastrophe, the weird escarpment of Alport Castles on the brow of the next hill. This was the point we were making for. We dropped into the dale of the Alport, forded the river, and breasted the steep slope opposite, which testifies in the confusion of hillocks and ravines that break its surface to the overpowering weight



shaken down from the summit, unsettling the very foundations of the hill.

Six men had gone on an hour ago, and were now visible as moving specks atop of the Tower, the big rock-mass that rises from out the accumulation of wreckage tumbled from the cliff. Seen end on, the huge piece of the hill that has slid away looks gigantic. Its outer slope is grassy, as it was ages ago, before it fell ; but the inner is a precipice, with few places accessible even to a climber. Between this and the main hill-mass yawns a deep hollow, heaped up with broken rocks, of all shapes and sizes. The front of the hill is still tottering. Every winter brings fresh piles of debris down to swell the ruin, amid which ferns and saplings contrive to carry on a precarious existence. Hacked into a range of miniature peaks and clefts, with a crazy rock-turret at one end, the crest of the pyramid offers fair sport to enterprising scramblers. Altogether, eight different ways up it were discovered, and, hard by, a moderately good face-climb, whereon one of our number managed to get into difficulties, and whilst he was being aided by the rope, was nearly crushed by the fall of a heavy slab. A queer chimney also was found, boasting a pair of chockstones, not easy to surmount ; but it was too earthy to be pleasant.

Flanking the pyramid, several lumpy rocks form subsidiary peaks, and the whole ridge is a mountain crest on a small scale ; its traverse from end to end, over all the obstructions, being an entertaining bit of sport. To stand at the end of the long ravine, into which the desolate hollow gradually diminishes, and look down towards Alport Dale, with the Tower blocking the view in the distance, is one of the most fantastic experiences even Derbyshire can afford. We went straight ahead from the top of the gorge, keeping to the summit all the way to Crook Hill. All along that lofty five miles, we commanded views at once of Derwent Dale on the left hand, and of the Ashop Valley on the right, seeing over Win Hill's shoulder into the upper parts of Edale, and catching the sunset glow on Mam Tor, Lose Hill, and the other bare

heights surrounding that great hollow. So huge are the swelling hill-shapes, that from this point one can hardly make out how there is room for Edale. All the major elevations of the Peak are in full sight as we wend our way towards Ashopton, and with the capacious dales opening almost at our feet, give one a sense of space and height that is intensified as the valleys slowly fill right to their rims with the mists and shadows of evening.



## THE RUCKSACK CLUB DINNER.

THE Annual Dinner of the above Club, 1906, took place at the Albion Hotel, Manchester, in December, and a representative of the Climbers' Club was present as a guest. Mr. Charles Pilkington, A.C., the President of the Rucksack Club, presided. The toast of the Climbers' Club was included in that of "Kindred Clubs," and our own President responded on behalf of the Alpine Club. Mr. Horace Walker, A.C., was amongst the guests present.

A very pleasing incident, during a most enjoyable evening, was the unanimous election of our own President, Mr. Slingsby, as an Honorary Life Member of the Rucksack Club. He is the only living life member, the late Mr. C. E. Mathews being the first and only one previously. We in the Climbers' Club desire to acknowledge the compliment paid to our President, and to the Club through him, by this honour. We also cordially render thanks for the liberal hospitality of the Rucksack Club on the occasion.

## EDITORIAL NOTES.

WE are very glad to welcome a new club, which has been started in the English Lake District, called The Fell and Rock Climbing Club. It is intended to form a bond of union between climbers in the Lake District. All information can be obtained from the Secretary, Edw. Scantlebury, 11 Clarence Street, Ulverston, Lancs.

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THE Editor will be glad to receive articles from any members on climbs either in the British Isles or elsewhere which are likely to be of interest to readers of the *Journal*. He would be especially pleased to receive regular accounts of the Christmas or Easter meetings of members held in The Lakes, Wales, etc. It is felt that it would be of great interest to members if short accounts, not necessarily articles, could be published of Summer tours either in the Alps or in the British Isles.

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NOTES, etc., must reach the Editor for the March number by the end of February ; for the June number by the end of May ; for the September number by the end of August ; and for the December number by the end of November.

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CENTRAL GULLY AND EASTERN BUTTRESS OF LLIWEDD.  
—A new climb was made on September 11th, 1906, by J. B. Farmer, A. W. Andrews, Mrs. Farmer and O. Eckenstein. An account of this and of other climbs on Lliwedd will shortly appear in the *Journal*.

## COMMITTEE NOTES.

THE following new members have been elected :—

Arthur Cyril Adams, 36 Beauchamp Road, Upper  
Norwood.

Manley Farrer, 15 Chapel Place, Ramsgate.

William F. Shannon, 31 West Hill, Highgate.

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ON the suggestion of Mr. W. H. Fowler, and with the kindly assistance and advice of Dr. E. G. C. Daniel, certain additions have been made to the appliances and medicine chests kept at Gorphwysfa and at Wasdale Head Hotel for use in case of accidents.

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THE subscriptions to the C. E. Mathews Memorial Fund amount so far to £15 5s., and a joint Committee of the Yorkshire Ramblers and the Climbers' Club will shortly be formed to carry out the details.



