Saxifrages. By Charles Packe, F.L.S.

A YOUNG man who declined to join a rubber was met by Talleyrand with this reproof: 'Monsieur, quelle triste vieillesse vous vous préparez, vous ne jouez pas le whist!' Botanical papers, I know, are not popular with Alpine men; but to anyone who, scared by the title, is disposed to skip these pages I would say: 'Monsieur, quelle triste vieillesse vous vous préparez, vous n'étudiez pas la botanique!' In infirm old age, when feats of mountaineering have become more toil than pleasure, we shall still be able to do a little plant-collecting; or, later still, when even that is beyond our power, it will be a solace to recall the past from the leaves of our herbarium. For those to whom the glorious high summits are still accessible botany ought to have still greater charms.

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teresting way from Tiers to the Seisser Alp may be found by ascending the glen of the Tschamin nearly to its head, and then climbing the precipitous ground on the north side of the stream to a point on the ridge close to the foot of the Ross Zähne, as suggested by Mr. Ball (Eastern Alps, p. 484).

The most direct route from Botzen to Campidello in Val Fassa is the Falban Joch. This pass crosses the ridge dividing the glens of the Tschamin and Duron, and lies between the peaks of the Ross Zähne and the Falban Kogel, a northern outlier of the Kessel Kogel. It was reached in 1863 from the Duron Thal by Mr. Tuckett, who did not, however, on that occasion descend into the Tschamin Thal, but by bearing to the right under the cliffs of the Ross Zähne descended to Bad Ratzes by the Tschapit Bach. Mr. Tuckett subsequently (1872) effected a direct descent from the Falban Joch into the Tschamin Thal, the scenery of the upper part of which is described by him as singularly interesting. The other passes of the Rosengarten have still to be discovered. It will probably be found possible to gain the ridge between the Kessel Kogel and the Federer Kogel either from the Tschamin Thal or by the spur which separates that glen from the stream of the Purgametsch. This done there would seem to be no difficulty in making a descent into the head of either Vajol or Vajolet, according as the destination of the traveller be Campidello or Vigo. A more direct route from Tiers to the last mentioned place would lie through the glen of Purgametsch itself, from the head of which it may be found practicable to scale the western face of the Rosengarten range between the Federer Kogel and the Rothewand Spitz. The descent into Vajolet from this point is certainly possible. The pass between the Rothewand Spitz and the Kalbleck (if any exists) is so near the highway of the Caressa pass as to be of little practical value. All the passes above indicated must necessarily lead through scenery of the first order, and will, in all probability, be found to involve a formidable climb.

By botany I do not mean the mere dry study of the structure and organisation of plants, which repels many at first, though this cannot be altogether excluded; but the investigation of their habitats, and geographical distribution, especially in the comparison of Alpine plants, as existing on the different mountain ranges.

It is a peculiarity of Alpine vegetation that it is not always on the mountains that are the most contiguous that we find the greatest similarity. Plants often disappear on the adjacent ranges for some hundreds of miles to reappear in a comparatively remote locality, where the circumstances of climate and soil are more identical. Thus, in the Dolomites and Carpathians we find several Pyrenean species, such as the *Horminum Pyrenaicum*, *Scorzonera aristata*, *Crepis pygmæa*, *Gentiana Pyrenaica*, *Androsace villosa*, and *Dianthus barbatus*, which are wanting in the intervening mountains of the Central Alps. In other cases we find particular species and even genera, as *Ramondia Pyrenaica* and *Wulfenia Carinthiaca*, restricted to a limited part of some particular mountain range. The causes of this irregular distribution are not easy to ascertain, but let me begin by considering what constitutes an Alpine plant.

Alpine plants may be divided into two classes.

1. Those which have descended from the Arctic regions, being driven down to lower latitudes by the glacial epoch, and ultimately forced to take refuge on the mountain ranges, being forced upwards by returning heat.

2. Plants from the plains, that had flourished in the temperate regions till these regions became torrid under the heat of the miocene epoch which preceded the glacial cold; and which then were compelled to mount the higher elevations in search of a more genial climate, which still enabled them to exist.

Both these classes must have exercised their influence upon each other, and mutual modifications must have been the result of their struggle for existence; so that it may not be always easy to assert to which of the two every Alpine plant should be assigned. It will be seen that the second class, plants originally from the temperate regions, were the first colonists of the mountain summits; but the conditions of existence were probably less favourable to them, and in the glacial epoch which supervened, many of them must have been utterly exterminated; so that, as might be expected, the proportion of Arctic plants on the Alpine ranges is considerably in excess of those from the surrounding plains.

According to Dr. Hooker, out of 762 phænogamous plants found within the Arctic Circle, no less than 530 inhabit the

Alps and Central and Southern Europe. On the other hand, Dr. Christ, starting with a definition of Alpine plants as those species found only above the limits of forest trees, and confining himself to the district from Mount Ventoux to Karst in Lower Austria, gives a list of 693 species, of which, he says, only 271, or two-fifths, are northern. Hence he concludes that the original home of Alpine plants was in the mountains of temperate Asia; whence they have been dispersed East and West, rather than North and South.

If we accept, with Dr. Christ, that plants have their home and origin where they flourish most abundantly, I think it is impossible also to conclude with him that they have but one centre of creation. To assume this would, I think, be contrary to facts as far as they are under our observation. Without venturing to conjecture how many original centres there may have been, we may fairly assume that on each continent, as it appeared above the waters, vegetable life has been developed by the vivifying rays of the sun; and that these species or genera—call them which you will—in the course of a series of alternate invasions and retreats before each other, have exercised a vast and undoubted modification on their original forms. That the line of the invasions and retreats was principally north and south we have some reliable evidence from the consideration of the Alpine and Arctic flora; and in the changes of climate that we know to have taken place from the Pole to the Equator I believe we have a sufficiently effective cause for such migrations. Against those who hold Mr. Darwin's views it is often objected that they cannot adduce a single instance of a change of species within man's observation. I do not think this is true in the animal kingdom, but I am quite sure that it is not in the vegetable. Anyone who has paid some attention to the growth of plants, especially of those on Alpine ranges, must have soon found how impossible it is to draw a line between species and varieties, even in the same mountain chain, and still more if he compares closely-allied species in different longitudes. From the original mixture of Arctic and Temperate species, as well as from the severe struggle for existence, which favours any tendency to modification in Alpine plants, the intercrossing and approximation of cognate forms is much more observable in such situations; and, in proportion as the practical botanist extends his range of observation to different countries, and increases his knowledge, he will seek to generalize the species, and restrict their number.

Among widely-dispersed genera, which ascend to the farthest Arctic as well as to the highest Alpine situations, the

Saxifrage family stands conspicuous. Under various forms it exists on all the principal mountain ranges in both hemispheres. In the temperate region of Asia and America we find some members of the family, the Escallonias and Hydrangeas, attaining the dimensions of a tree; while in Europe they only exist as herbaceous rock-loving plants, closely allied in habit as well as structure to the natural orders Sedum and Ribes, from which they differ principally in the form of the fruit. In following the dispersion of the Saxifrages on the mountain ranges of Central Europe it is interesting to endeavour to trace their original home.

Dr. Hooker gives a list of twenty-five distinct and well-defined Arctic species of Saxifrage, of which thirteen are found in the Alps of Europe. Dr. Christ gives a list of forty-four Alpine species of which thirteen only are Arctic. In both these lists we observe *S. aizoon*, *S. oppositifolia*, and *S. stellaris* are the most widely dispersed, and also the most abundant. The last two are British, and they all three grow on the limestone, silica, and alumina rocks indifferently, and may be taken as the three typical forms.

Though much resembling in habit and structure, the Saxifrages present great variety; but, disregarding the many sections to which for convenience they have been referred, they naturally fall into two great divisions; (1) those which have thickened, fleshy, entire leaves, with calcareous matter on the edges, and usually pitted with little pores; and (2) those which are destitute of calcareous matter, with the leaves less rigid, without pits, and often divided into segments. The first of these divisions, comprising the sections Aizoonia and Porphyrion, with fleshy leaves, and loving sun and dryness, approaches most to the Sedum family; while those of the second, with softer leaves, and not averse to shade and moisture, come nearer to the Ribes. We will commence with the first division, the Saxifrages, whose leaves are calcareous on the borders, and more or less pitted at the extremities.

Even the non-botanical traveller who has explored the valleys of the central Pyrenees must have admired the nodding plumes of the giant Saxifrages (*Saxifraga longifolia*), monarchs of their order, which wave from the limestone cliffs to which their silvery rosettes are fastened, with their flower racemes sometimes nearly a mètre in length. It is only in the valleys of the central Pyrenees, on the limestone rocks exposed to the sun, and generally out of the reach of the ruthless botanist that this Saxifrage is to be found. It grows at a height of from 1,200 to 2,000 mètres; and those who would

see it in perfection should visit the Pain du Sucre above Gavarnie at the end of June. Where the rocks are schist, and not limestone, another Saxifrage takes its place, *Saxifraga cotyledon*, almost equally beautiful, but with smaller racemes. This is also found on the Swiss Alps, both Eastern and Western, where it is more common than in the Pyrenees. In addition to these two we have the typical form *Saxifraga aizoon*, which is common in the Pyrenees, as on all the mountain ranges of Europe; and the beautiful little delicate form of *Saxifraga cæsia*, with its milk-white flowers and slender thread-like stems, which we again find on the limestone rocks of the Dolomites, but there accompanied by a kindred species, *S. squarrosa*, unknown throughout the Pyrenees. The two most striking plants, however, under this group are *Saxifraga aretioides* and *S. calyciflora* of Lapeyrouse; the former especially is remarkable from its being so restricted in locality, being only found in the central valleys of the Pyrenees from Cauterets to Luchon. Though a small plant it is conspicuous from its bright yellow petals, which, taken with its stiff calcareous leaves, distinguish it from any other Saxifrage, reminding one rather of a hybrid between *S. cæsia* and *aizoides*. It may be found in flower at the end of June near Gavarnie, in the valleys of Estaubé and Ossoüe, and earlier on the rocks of Somaoute above Gédre, where it is plentiful. I have also gathered it by the '*Cabane de Gaulis*,' well known as the sleeping *gîte* for Mont Perdu. The other species, *S. calyciflora*, Lap., or *S. media*, of Gouan, is still more beautiful. Like the last it grows on the limestone rocks, always with a sunny aspect. The calyx, petals, and flower-stalk are of a bright purple colour, which they retain even when dry, but which are seen to greatest advantage when springing from the silvery, glaucous leaf-rosettes, which are planted like stars on the limestone rock. The habitat of this species is also limited, beginning where the last ceases, in the neighbourhood of Luchon, on the rocks of St. Beat, and on the Peña Blanca below the Port de Venasque, on the Spanish side. At these two places, the point of junction of the two species, there are found some curious hybrids, *S. luteo purpurea*, and *S. ambigua*, but they are past flowering after June. *S. calyciflora* is also found on some of the limestone peaks which form the spurs of the Maladetta, especially on the Pic Paderne; and I have gathered it on July 16 at the Rencluse, just above the '*gîte*' where travellers sleep for the ascent of the Pic de Nethou. We again find this Saxifrage on the limestone rocks of the Vallée de Llo in the Eastern Pyrenees, but it extends no

further east, being stopped by the granite formation. In the Alps it appears to be entirely wanting, though it is said to exist on the Apennines of the Abruzzi.

Of the remaining section of this group the only species found in the Pyrenees is the common purple-flowered Saxifrage, *S. oppositifolia,* which is nowhere seen so fine and with such large flowers as in the neighbourhood of Héas and Gavarnie, especially in the Cirque de Trumouse, where in the early summer it paints the rocks with patches of blood-red.

Having now gone through this group of Saxifrages as existing in the Pyrenees, let us see how they are distributed in the Alps. Beginning with the Western Alps, we here find *S. aizoon* abundant as before, also the pyramidal Saxifrage, *S. cotyledon,* which in the Maritime Alps is developed in a rare, beautiful, and entirely distinct form, *S. florulenta.* The *Saxifraga cæsia* is still found, but in place of the *S. aretioides* and *calyciflora* we have three other form, *S. Valdensis, S. diapensoides,* and *S. Tombœensis,* not nearly equal in beauty to the two missing Pyreneans, though the last is remarkable from its trailing imbricated runners, which resemble those of the common lycopody. The purple Saxifrage remains the same, haunting the higher summits, but about the Mont Cenis it begins to be associated with a kindred species, *S. biflora.* This last gains strength as it goes eastward. It is very luxuriant under the shadow of the Matterhorn, on the moraine above the Hörnli, and in the neighbourhood of the Gross Glockner becomes the dominant species. Going farther east, in the Alps of Lombardy and Tyrol, *S. aizoon* is still constant, but we have frequent modifications of the pyramidal Saxifrage. *Saxifraga cotyledon* is more frequently replaced by other forms; *S. elatior,* to be seen very fine on the Monte Pavione near the Agnerola Alp, distinguished by its smooth-bordered though equally rigid leaves, as also by the purple spots on its white petals; and *S. mutata,* which has the same broad calcareous-edged leaves, scarcely serrated, but fringed, and the narrow petals, sometimes golden, sometimes a reddish brown; hence its name 'mutata.' This Saxifrage is stated by Engler, on the authority of the Abbé Baulu, to exist in the Pyrenees, where it has certainly not been found.

In the mountains of Tyrol another nearly allied form is associated with *Saxifraga cæsia,* the *S. squarrosa,* which, with flowers nearly similar, has the leaves more rigid and upright; and in the place of the two Pyreneans we have *S. Valdensis* and *S. Burseriana,* the last being especially remarkable, with its large white petals and sharp-pointed, glaucous leaves. It is

found on all the south-eastern Alps, and is especially abundant on the rocks in the neighbourhood of Lienz.

Still further east, upon the Dolomite ranges and in the Carnic Alps, we have fresh forms starting up. In addition to *S. mutata* and *elatior* we have two others which closely resemble the missing *S. longifolia* of the Pyrenees, though they cannot be said nearly to equal it in size or beauty. The first, *S. crustata* has a wide range eastward, but is nowhere seen to more perfection than in the gorges of the Marmolata, especially in that of Sottoguda, in which it flourishes luxuriantly as if expressly placed to add one more to its many attractions. Were it not for the wide interval that separates the localities where they grow, one could scarcely distinguish this Saxifrage from a pigmy form of the *S. longifolia.* The second species, *S. lingulata*, with its varieties, *S. lantoscana* and *cochlearis*, even yet more nearly approaches the Pyrenean plant, from which it differs chiefly in the form of the leaf, which is somewhat spathulate, and is furrowed on the upper side instead of convex.

On these eastern ranges the purple Saxifrages also are somewhat modified. We have the ordinary *S. oppositifolia*, which grows everywhere, but appears to be more dwarfed as it proceeds eastward. *S. biflora* is also very abundant, being especially luxuriant on the moraine of the Pasterze glacier, and in company with these are found three pigmy forms, *S. Rudolphiana*, *S. Kochii*, and *S. retusa*; the first two being probably mere varieties of the opposite-leaved, and two-flowered Saxifrages, and the last being chiefly characterised by its triangularly recurved leaves. The form *S. retusa* is recorded by Lapeyrouse, from the Pyrenees, as growing on the mountain of Llaurenti, but I could find no trace of it there, and much doubt its existence. Farther still to the east, on the mountain ranges of Greece and Turkey, we have three or four more species of Saxifrage belonging to this division, and there are also several hybrids, restricted to the areas on which both the parents grow. The two typical forms, *S. aizoon* and *S. oppositifolia* are found on all the high mountain chains of Europe; the first extending eastward to the Caucasus* and southern ranges of Asia, while the last, which keeps a more northern line of migration, reaches from the Altai and North Thibet to the Rocky Mountains of North America.

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* I take this opportunity of thanking my friend Mr. H. Walker for a specimen of *Saxifraga cartilaginea*, an eastern form of *S. aizoon*, which he brought me from the Caucasus.

From the consideration of this group of Saxifrages as distributed east and west, let us now turn to their range north and south. I believe that none of them cross the tropics into the southern hemisphere. The most southern that I have myself gathered was a dwarfed specimen of the purple-flowered Saxifrage from the Pic de Veléta in the Sierra Nevada, and this species, which also grows on the mountains of Scotland and Wales—with the exception, perhaps, of *S. stellaris*—is the most widely dispersed of the whole family of Saxifrages. Two only of this group exist within the Arctic Circle, and these are the same two that are most common on the temperate mountain ranges, namely, *S. oppositifolia* and *S. aizoon*; for *S. cotyledon*, which is found, though rarely, in Iceland and West Lapland, may be considered as merely a larger form of the last. Descending southward along the mountains of Scandinavia, these two have been modified as they spread east and west; the purple Saxifrage taking the forms of *S. biflora* and *retusa*, and the *aizoon* section developing into *S. cotyledon*, *S. mutata*, *S. elatior*, and *S. lingulata*. The *S. cotyledon* proper, both in the Alps and Pyrenees, seems only to grow upon the rocks of clay schist; and wherever the dolomitic limestone occurs it is replaced in the Pyrenees by *S. longifolia*, and in the Eastern Alps by *S. crustata*, two forms which are scarcely distinguishable, though geographically separated by a wide interval. The remaining Saxifrages of the group, of which *S. cæsia* may be taken as the typical and most wide-spread form, have no Arctic affinities, and may therefore, I think, be referred to the second class of Alpine plants, which have had their progenitors from the plains. These, having had the Arctic forms to contend against as well as their congeners, have undergone as we might expect yet further modifications than the Alpine-Arctic species, and for the most part they are more restricted in their habitat.

In a future paper I hope to consider the distribution of the remaining European Saxifrages, and in the meanwhile shall congratulate the Alpine Club on a growing disposition not wholly to disregard botany, which has taken root among some of its most distinguished members. To those, however, who bring home specimens I would venture to suggest the importance of noting the exact locality, and, where possible, the altitude above the sea, and aspect of the situation, as well as the nature of the rock. Exactitude and certainty in the locality is of far more importance than in the name, which can always be afterwards ascertained and corrected; and it is only by a rigorous attention to this that we can hope to throw any light

upon the distribution of plants, in itself an interesting study, and one which may one day help to solve the much-vexed question, the origin of species.

Apart, however, from all science there is a real pleasure in collecting plants, to be renewed years afterwards in turning over the treasures of the herbarium; and if sometimes disappointment is felt that the colours fade, or the forms crumble away, it will only once more impress the lesson which the leaves taught to the heroes who fought before Troy.

Sketches from the Apennines. By the Editor.

1. *The Pania della Croce.*

'There
The sunshine in the happy glens is fair,
And by the sea, and in the brakes
The grass is cool, the seaside air
Buoyant and fresh, the mountain flowers
As virginal and sweet as ours.'

Mat. Arnold.

MEMBERS of the Alpine Club are sometimes reproached with being always on the look-out for some great thing, and habitually neglecting the lower hills. No charge could be more unfounded. I doubt if anywhere in England, outside our Club-list, a body of 300 men could be found so familiar not only with Snowdon and Helvellyn, but also with the puny heights which lie within a modern Sabbath-day's journey of our smoky homes. The grass on Leith Hill and Hind Head is trodden every spring by boots which a month or two later will be breaking through the snows of Mont Blanc or the Jungfrau.

Towards our own English hills we may fairly flatter ourselves that we do our duty.

About the principal European ranges—the Alps, the Caucasus, the Pyrenees, the mountains of Spain and Norway—we know a good deal. We have had papers on Iceland, Lapland, the Carpathians, and Portugal. But there is one great mountain-chain in Europe which we have most of us at different times passed close to, yet have studiously neglected. What can our members tell us of the backbone of Italy, of the mountains which stretch from Genoa to the Straits of Messina? The omniscience of Mr. Ball embraces the Tuscan