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IX. *The Musci and Hepaticæ of Teesdale.* By RICHARD
SPRUCE, Esq., F.B.S.

READ 11TH JANUARY, 1844.

THERE is not perhaps in the British Islands a lover of wild plants who has not heard of Teesdale, and who does not preserve in his herbarium, as objects of especial interest, *some*, at least, of its many rarities; and there are not many, with the means in their power, who have denied themselves the exquisite pleasure of seeing these "gems of Flora" in their native wilds, and of gathering them with their own hands. Yet half a century ago no botanist had set foot in Teesdale, and it is little more than thirty years since "old Binks, the miner," discovered *Gentiana verna*, "doomed" till then "to blush unseen," though existing in the greatest profusion. To this beautiful plant he and his friend the late Mr. Oliver of Middleton shortly afterwards added the no less rare *Saxifraga Hirculus*; and within the space of a few years they had become acquainted with nearly every flowering-plant and fern known to grow in Teesdale at the present day. A district so fertile in uncommon Phanerogamous plants might reasonably be expected to produce an equal abundance of Cryptogamia, and a reference to the second volume of Hooker's 'British Flora' will show that it has been very successfully explored for lichens, especially by Mr. Robertson and the late Rev. J. Harriman; but if we consult the descriptions of *Musci* and *Hepaticæ* in the same volume, we shall find only a single species (the *Gymnostomum Donianum* of Smith) recorded to grow in Teesdale! Even Baines's 'Yorkshire Flora' contains only four Teesdale mosses, of which the one above mentioned is the only rare species. In order to decide whether this lack of bryological intelligence relative to a tract of country of such promising aspect arose from its real poverty in objects of that class, or, as was more probable, from its having never been properly explored, I have devoted nearly three weeks during the past summer to a careful examination of what is called Upper Teesdale, viz. that portion of the vale of the Tees which lies *above* Middleton in Teesdale; at the same time exploring, but less minutely, the district between Middleton and Barnard Castle, extending in a contrary direction. As I anticipated, Teesdale has proved not less rich in mosses than in flowering-plants and ferns; for besides ascertaining it to produce

many of the rarest mosses previously known as British, I have had the pleasure of discovering *six* species quite new to our islands; these are *Bartramia calcarea* (Bruch and Schpr.), *Bryum acuminatum* (Bruch and Schpr.), *Br. obconicum* (Hornsch.), *Br. pallescens* (Schwægr.), *Orthotrichum stramineum* (Hornsch.), and *Hypnum confervoides* (Brid.). Other mosses will be found in the following list, not previously described in any work on British bryology, but in the discovery of which I have been anticipated by other botanists. Amongst the *Hepaticæ*, though few species fructify in the summer months, and the search is consequently prosecuted with diminished interest, I have met with considerable success. A *Jungermannia*, originally discovered near Bantry by Miss Hutchins, and called at first by Hooker *J. Bantriensis*, but afterwards referred by him to *J. bidentata* as a variety, I have, by finding it with male and female fructification, demonstrated to be a very distinct species.

What is above stated will suffice to show that few districts rival Teesdale in their bryological productions; in fact it wants only *wood*, in which it is remarkably deficient, to render it equal to any in the British isles*. Cromaglow, near Killarney, is the only locality I have seen superior to it: in that *Paradise of mosses* every rock is moss-clad, mosses drink the spray of every little waterfall, and the trunk of almost every tree is so thickly begirt with mosses as to appear of double its real diameter! Teesdale can show nothing like this; but the rocky banks of its wild river nourish many a moss unknown to Cromaglow, and yielding to none in beauty and rarity.

Amongst the mosses which most conspicuously ornament the rocks in Teesdale may be mentioned the various species of the genus *Bartramia*, all of which, with the exception of *B. arcuata*, were covered with their elegant pomiform capsules at the time of my visit. By far the most striking of these is the new *B. calcarea*, and it is besides of such frequent occurrence that the most casual observer could not fail to notice it. The *Brya*, too, were in the greatest variety and perfection, and in this genus alone I gathered not fewer than a hundred forms. Among all the tribes of mosses there is none more difficult than the *Bryaceæ*, and perhaps none has been more imperfectly studied by English botanists; at least, a perusal of the 'Bryologia Europæa' of Bruch and Schimper has shown me how little I was previously satisfied to know concerning it; and it is to be hoped that the publication of this unrivalled work will give a new impulse to the

* The few trees which exist in Upper Teesdale produce some mosses of such real excellence, that one may well be allowed to regret the destruction of the forests which tradition reports to have once extended over the whole of that region.

progress of bryology in this country,—a country which, as Bruch and Schimper themselves confess, possesses “la plus belle végétation cryptogamique” of any in Europe.

As I had not studied the *Brya* very extensively before the present year, I had failed to remark any peculiar beauty in the generality of the species, and I read with a smile that portion of the introduction to the genus *Bryum* in the ‘Bryol. Europ.’ which relates to their habits and geographical distribution, where their charms are eulogized in the most glowing terms; but what I have seen in Teesdale compels me to admit, that in variety of colour and elegance of appearance the *Brya* yield to no other mosses. In their sixth Fasciculus the authors of the ‘Bryol. Eur.’ have the following remarks on the alpine *Brya*: “Mountains of moderate height give birth to only a small number of species; there we find in the clefts of rocks *Br. pallescens* and *cæspitium*, on the earth *Br. argenteum* and *atro-purpureum*; but arrived in subalpine and alpine regions, a new and rich vegetation presents itself to the bryologist. Here, where on heights beaten by the winds, in ravines filled with snow, and at the moving foot of eternal glaciers, plants of superior orders disappear or only exist in a diminutive state, many species of *Bryum* render less dreary those isolated solitudes, and charm from afar the eyes of the dejected traveller. And who does not recall with delight the fine swelling tufts of *Bryum turbinatum* var. *Schleicheri*, whose tender green borders the dissolving snows, or conceals fountains clear as crystal? or the deep-green velvet of *Br. Ludwiggii*, which lines, alternately with the sombre patches of *Br. cucullatum*, the wintry ravines of the Alps? Even before attaining the alpine region we are agreeably surprised by the fine *Br. alpinum*, which begins to be covered with its purple capsules, so rare in the low countries, where this beautiful species is only of accidental occurrence; here, in company with the magnificent *Br. pseudo-triquetrum*, it spreads over rocks moistened by the water which trickles from the heights. The hollow ways are decked with the elegant *Br. longicollum* (*Br. elongatum*, Dicks.), with its slender and graceful capsules,” &c. &c. Though Teesdale possesses no mountains whose height can be compared to those of Switzerland and “Rheinland,”—no eternal snows and glaciers, its more northerly latitude renders it capable of producing many alpine plants at a less altitude than in the Vosges and Alps, or even in the mountains of the more southern parts of our own islands. Thus while my friend Dr. Taylor has to ascend to the summit of Brandon mountain for *Br. Zierii*, I have seen it in Teesdale growing in the greatest luxuriance at the altitude of a thousand feet, which is more than two-thirds less than the former.

For a complete geographical and geological description of

Teesdale, I must refer to the second Part of Phillips's 'Geology of Yorkshire,' but the following sketch of part of the course of the Tees, extracted from page 153 of that work, may be acceptable:—

"The Tees rises on the east part of Crossfell, which is 2901 feet high, flows eastward four miles, through the Yoredale limestones to the Tyne bottom limestone, and receives on its right bank a stream called Trout beck, which flows north-eastward from a hollow in the Penine chain on the main limestones 2400 feet above the sea. The united stream flows south-east, first in Tyne bottom limestone, and afterwards in Whin sill, to the Weel, 1489 feet above the sea, then falls over the basaltic rocks of Caldron Snout, about 200 feet, and receives Maize beck. The general course of Maize beck is east-north-east. From Caldron Snout the Tees still runs east-north-east till it receives the long stream of Harewood beck, flowing south-east, which direction it takes and continues in basalt to below the miners' bridge, thence south-eastward in Yoredale limestone, grits and plates, to near Egglestone, having received on the right the Lune flowing east-by-north, thence to Egglestone abbey in plates and grits above main limestone, receiving on the right the waters of Balderdale and Deepdale, east-by-north. Two miles below it receives the Greta."

Of the other streams alluded to in the following list, Eppersgill beck runs into the Tees, on the Durham side, between the High Force and Winch Bridge; its course is almost entirely in limestone. "Hell Cleft" is the name given to a ravine (excavated in the limestone) above the village of Newbiggen; it is also traversed by a considerable stream. Blea beck comes tumbling down over basaltic rocks on the north side of Green Fell (in Yorkshire) and joins the Tees a little above the High Force. The beautiful cascade called White Force is formed by a stream which falls over Cronkley Scarr, and joins the Tees not far from Winch Bridge; here the granular or "sugar limestone" may be seen both above and below the basalt: according to Professor Phillips, "portions of the upper members, limestone and shale, are raised up and enveloped in the Whin, which penetrates in two wedge-shaped expansions between the limestones and shale." The High Force is well known to be one of the finest waterfalls in England, and it is scarcely necessary to mention that here the whole body of the Tees is hurled over a precipice of 63 feet in height*, the lower portion of which consists of limestone and the upper of basalt.

The triangular space between the Tees, the Lune and Maize beck, constituting the north-west angle of Yorkshire, is occupied by a mountain range which stretches from west to east, and of

* The height of the fall may be a few feet less than this.

which Mickel Fell, the westernmost and loftiest summit, is 2600 feet high. Proceeding hence in an easterly direction, we come successively upon Cronkley Fell, Green Fell and Holwick Fell, each of which is less lofty than the one preceding, until we finally descend to the eastern angle of the triangle, at the junction of the Lune and Tees, which may be 900 feet above the level of the sea. Cronkley and Holwick Fells terminate to the north in a long and lofty range of basaltic cliffs, called "Scarrs;" and Falcon Clints or Widdy-bank Scarr is a similar range (but with a southern aspect) extending from Caldron Snout about a mile down the left or Durham bank of the Tees. The mountain limestone formation expands over the whole of this triangle, except where the basalt is interposed, which it is indeed "in such masses as to predominate in the general aspect of the region, and give to Upper Teesdale the character of a basaltic formation."

I am not aware that I gathered a single moss in Teesdale on any other rock than those above mentioned, and I was from the first careful to note which of the two every species appeared to prefer; but it was with some degree of disappointment I ascertained that very few mosses were absolutely confined to either, and there are not more than half-a-dozen species in the following list which I expect would obstinately refuse to grow on one or other of them. Even the flowering-plants which we most usually find on limestone, such as *Avena alpina* and various *Orchideæ*, appear equally partial to the basalt. *Helianthemum canum*, which is confined to the "sugar limestone" on Cronkley Fell, is perhaps the only one which it would surprise me to see growing on the basalt; but as to *Bartsia alpina*, *Elyna caricina*, *Carex capillaris*, *Polygonum viviparum*, *Saxifraga stellaris* and *aizoides*, and many other of the "glories" of Teesdale, which it gave me great pleasure indeed to see, but which I was content to leave untouched, they assuredly grow in equal luxuriance on both formations.

But my object was not so much to ascertain the distribution as to determine the limits of the different species; and what follows is not a mere list of localities, but contains the result of extensive observation in the field, and careful investigation and comparison in the cabinet. I have adopted the generic distribution of the 'Bryologia Europæa,' so far as the published numbers of that work extend, because it is by far the most natural of any I have seen, and I have no doubt will be adopted, in great part at least, by the bryologists of this country, when its merits come to be fully known*. I have also in many cases quoted

* Wherever the nomenclature differs from that of 'Musc. Brit.,' the synonyms of this work are always added.

from the same work the specific characters of such mosses as have not been previously described in any work on British bryology; but the numerous analyses and descriptive remarks are entirely deduced from my own observations.

The total number of species observed in Teesdale amounts to 208, of which 167 are *Musci* and 41 *Hepaticæ*; but this can only be regarded as an approximation to the existing number; and a residence of three or four years in the centre of the district, with an attentive examination of localities at all seasons, would not more than suffice to ascertain the exact amount of its treasures. I have to add, that my collection contains a few mosses which from their imperfect state I have been unable to determine satisfactorily; these are not included in the foregoing enumeration.

Musci.

1. *Andræa alpina*, Hedw. Limestone rocks on Cronkley Fell.
2. *A. Rothii*, Mohr. Cronkley Fell, on limestone; Falcon Clints, on basalt.
3. *A. rupestris*, Hedw. Frequent on rocks and stones. I gathered a large var. on Cronkley Fell, growing with *A. alpina*, and scarcely to be distinguished from it at sight.
4. *Anictangium ciliatum*, Hedw. White Force, Falcon Clints and other places, yet nowhere abundant.
5. *Anomodon curtispiculum*, H. and T. Walls near Romalldkirk and below the High Force inn. Especially abundant in the wood by the Tees' side below Holwick, and in fruit, but out of season.
6. *A. viticulosum*, H. and T. Trees and rocks, frequent.
7. *Aulacomnion palustre*, Schwægr. (*Bryum palustre*, H. and T.) Bogs and moist rocks.
8. *A. androgynum*, Schwægr. (*Bryum androgynum*, Hedw.; H. and T.) Shaded rocks below the High Force, with gemmæ.
9. *Barbula fallax*, Hedw. (*Tortula fallax*, H. and T.) By the Tees' side.
10. *B. muralis*, Timm. Walls.
11. *B. ruralis*, Hedw. Walls, &c. between Middleton and Barnard Castle.
12. *B. subulata*, Brid. Banks and rocks, both in the high and low grounds.
13. *B. tortuosa*, W. and M. Frequent on limestone rocks. A small var. occurs on the sugar limestone near the summit of Cronkley Fell, which forms low spreading patches of a brownish hue; the leaves are shorter than in the ordinary form, their nerve less broad and strong, and the capsules are always curved.
14. *B. unguiculata*, Hedw. Common.
15. *B. vinealis*, Brid. "Cæspitosa, dioica; foliis recurvo-patentibus, ovato- et elongato-lanceolatis; capsula ovato-oblonga vel oblongo-cylindrica, erecta, annulata, brevirostra; peristomii

membrana conjunctiva longiore, dentibus semel contortis."—*Bryol. Europ.*

B. vinealis, Brid. *Bryol. Univ. i. Suppl.* p. 830.

On a wall by the road leading from Barnard Castle to Lartington, with capsules just coming to maturity, June 23rd. It grows intermixed with *Weissia curvirostra*, and the reddish stems are so much alike in both, that a casual observer would hardly distinguish them.

B. vinealis is very closely allied to *B. fallax*, but differs from it as follows. *Leaves* longer and narrower, spreading and somewhat recurved (but not squarrose), with nearly plane margins; the inner perichaetial leaves scarcely differing from the rest, but in *B. fallax* much broader in their lower half and loosely sheathing the pedicel: *capsule* annulate: *operculum* shorter: *peristome* only *once* (in *B. fallax* *three or four times*) twisted. Besides, as Bruch and Schimper observe, "les fruits mûrissent en été, époque à laquelle ceux de *B. fallax* sont passés depuis longtemps." At the time I now write (Nov. 9th) the capsules of *B. fallax* are just beginning to ripen.

I cannot account myself the discoverer of this moss in Britain, for Mr. Wilson has lately sent me specimens gathered by himself at Nant-y-Belan, near Wrexham, in 1833; and he suggests that even the *Zygotrichia cylindrica* described by Dr. Taylor in the 'Flora Hibernica' may be the same species.

16. *Bartramia arcuata*, Brid. Heathy and rocky situations, abundant, but I did not succeed in finding capsules.

17. *B. calcarea*, Br. and Sch. "Procera, foliis secundis vel subsecundis, confertis, longioribus, *crassicostatis*, *laxius* reticulatis; perigonalibus omnibus *acute acuminatis*, solidi-costatis; peristomii minoris dentibus *remote* articulatis."—*Bryol. Europ.*

Moist springy places, frequent, both on the limestone and basalt. Very fine by the road-side between the High Force inn and Winch Bridge.

This magnificent species was detected a few years ago by Bruch near Deux Ponts, and it has since been observed in the Vosges, Jura, and other mountain regions of continental Europe. The authors of 'Bryol. Europ.' state that they have never found intermediate states between it and *B. fontana*, and that it constantly preserves the characters they have assigned to it. I have similar testimony to offer; for I distinguished the two, by habit alone, almost on my entering Teesdale, and during my stay I continued to observe them almost daily without detecting any feature calculated to shake my conviction of their being specifically distinct. I shall now state the differences which appear amply to justify their separation. In *B. calcarea* the *stems* are stout, densely caespitose; *leaves* secund (usually patent in the other), of larger size, narrower, and tapering to a longer point, *all* lanceolato-

acuminate (not ovato-acuminate and lanceolate on the same plant): areolation wider: nerve remarkably strong and solid, and offering a great contrast to that of *B. fontana*. These differences are most striking on the floriferous branches of the male plants. The male flowers consist of fewer leaves, *all of which are acuminate and nerved throughout*; but the inner perigonal leaves in *B. fontana* are *very obtuse*, with an abbreviated or obsolete nerve*. The peristome is smaller, the outer teeth shorter and broader, and the texture of the outer paries of the capsule is less dense near its mouth.

18. *Bartramia fontana*, Sw. Less frequent than the last, but fruiting beautifully in Hell Cleft.

19. *B. gracilis*, Flörke. At the White Force, attaining a large size; rocks below the High Force.

20. *B. Halleriana*, Hedw. In the clefts of basaltic rocks near the High Force, with fruit in a good state.

21. *B. ithyphylla*, Brid. Frequent on basaltic rocks, especially on Cronkley and Holwick Scarrs.

22. *B. pomiformis*, Hedw. Rocky situations near the High Force, &c.; less frequent than the last. Var. *β. crispa*, intermixed with *B. Halleriana*.

23. *Bryum acuminatum*, B. and S. "Monoicum; caule simplici innovationibus ramoso, basi radicante; foliis caulinis inferioribus parvulis, remotis, ovato-lanceolatis, erectis, superioribus fastigiatis, confertis, duplo-majoribus, lineari-lanceolatis, 1—2 plicatis, margine valde revolutis, apice serratis, costa ad apicem producta; capsula longicolla, gracili, horizontali, operculo conico."—*Bryol. Eur.*

Pohlia acuminata, Hoppe and Hornsch, *Bot. Zeit.* 1819, p. 94; *Brid. Bryol. Univ.* i. p. 610.

Near the west end of Holwick Scarr, very scarce, and I did not succeed in finding more than a few *dead* capsules.

It has also been discovered more lately by Mr. Wilson in Wales ("Cwm Idwel, Aug. 1843"), and from a comparison of his specimens, which are in very good state, with others of *Br. elongatum*, Dicks., I am inclined to regard them distinct. In both species the inflorescence is monoicous, but in the former the *antheridia* are included in *gemmae* seated at the base of the female flower; whereas in the latter, they stand in pairs in the axils of the perichætal leaves. Besides, in the former the *leaves* are of a deeper green, shorter and broader yet with a more slender point, less decidedly serrate, with margins more strongly recurved, a much stronger nerve and smaller areolation. In the form of the capsule, the two mosses present scarcely any difference.

* The term 'ecostata' applied to them by Bruch and Schimper is too strong.

Bryum acuminatum appears to be of frequent occurrence on the continent, and many varieties and subvarieties are described in the 'Bryol. Europæa.'

24. *Bryum albicans*, Wahl. Near the High Force and other places, but barren.

25. *Br. alpinum*, L. Frequent on low moist rocks; I saw no fruit.

26. *Br. annotinum*, Hedw. In fruit near the High Force inn, and on the moor as you go to Cronkley Bridge, but scarce.

27. *Br. argenteum*, L. Frequent.

28. *Br. cespititium*, L. On a wall near Barnard Castle. The only station observed in Upper Teesdale was upon a wall near the farmhouse on the hill above the High Force.

29. *Br. capillare*, L. On walls between Barnard Castle and Middleton; on rocks in Upper Teesdale.

30. *Br. carneum*, L. Moist sandy situations.

31. *Br. cernuum*, B. and S. "Caule ramoso, radicante; foliis patulis ovato-acuminatis, concavis, costa excurrente mucronatis; capsula in pedicello elongato magis minusve curvato nutante vel pendula, pyriformi, operculo parvulo, convexo, acuminato, annulo magno; peristomio interno externo adglutinato."—*Bryol. Europ.*

On walls by the road-side all the way from Barnard Castle to the High Force inn, especially abundant about Romalldkirk and Mickleton; it is also frequent on the rocky banks of the Tees, growing along with *Br. inclinatum*.

Hedwig, having failed to observe the inner peristome (in consequence of its being closely soldered to the outer), included this moss in his genus *Cynodontium*, to which he assigned the following character: "Peristomium simplex octo aut sedecim parium. Sporangium absque apophysi. Flos terminalis hermaphroditus." By Swartz it was placed in *Didymodon*! Hornschuch formed of it his genus *Ptychostomum*, and divided it into several spurious species. But I am doubtful whether it can be considered distinct from *Br. inclinatum*; the adhesion of the inner peristome to the outer is often only partial, and if this character be abstracted little is left to separate them. After having compared a great many states of both mosses, I can only find that the leaves of *Br. cernuum* are broader, yet tapering more suddenly into a slender point, and that the outer peristome is shorter. If these characters prove constant, *perhaps* they may suffice to maintain *Br. cernuum* in the rank of a species, but at present I hardly expect such will prove to be the case.

32. *B. crudum*, Huds. Abundant, especially in the crevices of shady rocks. This species, though in habit one of the most marked of all *Brya*, varies considerably in the direction of its capsules: some-

times, as in specimens gathered by Ettersgill beck, they are nearly or quite erect; at others perfectly pendulous, as on Cronkley Fell.

33. *Bryum inclinatum*, B. and S. "Hermaphroditum; caule breviusculo, radiculoso-tomentoso, parce ramoso; foliis ovato-lanceolatis, longius acuminatis, integris; capsula nutante vel pendula, ventricosus-vel ovato-pyriformi, microstoma, annulata, operculo convexo, apiculato; peristomio interno libero, ciliis rudimentariis seu nullis."—*Bryol. Europ.*

Pohlia inclinata, Swartz, *Musc. Suec.*, pp. 45, 96. t. 5. f. 11; *Brid. Mant. Musc.*; *Schwagr. Suppl.* i. pt. ii. p. 73. t. 63.

Br. turbinatum, var. *Muscol. Brit.*; *Walker-Arnott, Dispos. meth.*

However questionable may be the propriety of disuniting *Br. cernuum* and *inclinatum*, I cannot doubt that the latter is a very distinct species. I gathered in Teesdale, between the two, above twenty varieties, all equally distinct from *Br. cæspitium*, to which, in point of fact, *Br. inclinatum* is far more closely allied than to *Br. turbinatum*, whither it has been referred by Walker-Arnott and the authors of 'Musc. Brit.' *Br. inclinatum* may be distinguished at sight from *Br. cæspitium* by its capsule tapering nearly equally to each extremity (often exactly spindle-shaped) and by its far smaller and more pointed operculum; besides, the leaves have less of that silky appearance to be observed in the other, their nerve is less produced, and they are furnished with a border of three rows of narrow cellules. The inflorescence is constantly hermaphrodite (dioicous in *Br. cæspitium*); the inner peristome wants the intermediate cilia, or, if present, they are imperfect and destitute of the large and well-developed lateral hooks (appendiculæ) so remarkable in *Br. cæspitium*; and lastly, the seeds are three times the diameter of those of *Br. cæspitium*.

Although *Br. inclinatum* and *cernuum* exist abundantly in Teesdale, only a single alpine habitat was observed for *Br. cæspitium*. In accordance with this is the remark of Bruch and Schimper on the latter species, "montes editiores vix apud nos ascendere videtur."

34. *Bryum julaceum*, Smith. Caldron Snout, very scarce.

35. *Br. nutans*, Schreb. Heathy situations, as well as on walls and stones.

36. *Br. obconicum*, Hornsch. in litt. "Dioicum, innovando ramosum; foliis ovatis, oblongo-ovatis, acuminatis, costa procurrente cuspidatis, submarginatis, margine non incrassato revolutorecurvis, integris, concavis, apicem versus carinatis, erectiusculis, siccis vix tortilibus; capsula subpendula, pendula, longicolla, clavata, operculo hemisphærico, papillato."—*Bryol. Eur.*

On a wall, under the shade of trees, by the road leading out of Barnard Castle to Lartington, along with *Br. capillare* and *cernuum*.

This beautiful species, which is mentioned by the authors of 'Bryol. Eur.' as being "e rarioribus," is distinguished from *Br.*

capillare at first sight by its long slender capsule, emulating that of *Br. elongatum*, yet “*plurimo tempore perfecte pendula*,” and by the pedicel being curved in its upper portion into a much wider arc. It may be further distinguished by the following characters. *Leaves* tapering more gradually to a point, less distinctly marginated, of a fine deep green (those of *B. capillare* mostly with a yellowish or brownish tinge), their nerve stronger and always excurrent. Texture of the outer paries of the capsule very compact near its mouth, the 4—5 uppermost rows of cellules being far smaller than the rest, while in *B. capillare* only one or two of the rows near the mouth are slightly contracted in dimensions. *Operculum* larger, more convex. *Annulus* very large, nearly twice the breadth of that of *B. capillare*. Teeth of outer peristome with a broader red base, within the capsule.

Br. torquescens, B. and S. (of which I have not yet seen any specimen), is mentioned by Bruch and Schimper as a species which might be confounded with *Br. obconicum*, but the latter (say they) may be distinguished by its more slender capsule, with a longer neck, and by the leaves, which are of a different form and twist less regularly in drying. Besides, the inflorescence of *Br. torquescens* is hermaphrodite.

37. *Bryum pallescens*, Schwægr. “Monoicum, cæspitosum; caule ramoso, radiculoso-tomentoso; foliis ovato-lanceolatis, integerimis, margine reflexis, costa sub vel paulo ultra apicem evanida; capsula horizontali, inclinata, pyriformi-oblonga, collo longiusculo, operculo convexo, longius acute acuminato.”—*Bryol. Eur.*

Br. pallescens, Schwægr. *Suppl.* i. pt. ii. p. 67. t. 75; *Brid. Bryol. Univ.* i. p. 645.

Br. speciosum, Voit.

On rocks as well as on sandy deposits, by the Tees below Winch Bridge; Hell Cleft, very sparingly.

Var. *β. boreale*. (*Br. boreale*, Schw.) Rocks in Ettersgill beck.

Although fully satisfied that this is the moss described in the ‘*Bryol. Eur.*,’ having compared it with an original specimen from Bruch (given me by Mr. Wilson), I have had great difficulty in persuading myself of the validity of its specific claims; but this has chiefly arisen from my having got hold of some puzzling varieties, and I now think it may prove a genuine species; at the same time leaving it to further observation finally to decide the question. Bruch and Schimper’s remark, “*Cette espèce varie infiniment*,” would prepare one to expect some anomalies.

From *Br. inclinatum*, growing along with it and not very dissimilar in habit, *Br. pallescens* is to be distinguished by the following characters:—The *leaves* are cuspidate (not acuminate), except on the ramuli and innovations, where they are often nar-

rower and run out into a longer point; their margins only *reflexed*, not *revolute* as in the other: the *inflorescence* is *normally* monoicous: the *capsule* has a longer neck and is mostly sub-clavate: the operculum is longer: the peristome is larger: the outer teeth far longer, tapering to a very slender point, and closely trabeculate; and the *seeds* are somewhat smaller. To this may be added, that the outer teeth are *strongly inflexed* by drying, while the processes of the inner *stand erect* between the interstices: this never occurs in the other.

The form which grows on the sandy margin of the Tees has the inner peristome very fragile, and the cilia scarcely appendiculate.

The large and beautiful var. from Ettersgill beck has the pedicels widely curved, and twisted just below the collum so as to bring the lower face of the capsule uppermost. I have found *antheridia* mixed with *archegonia* in two out of five or six fertile flowers that I have examined; yet separate gemmaceous male flowers are abundant on the same plants; and in all the other states of this species I have been unable to detect a single hermaphrodite flower*.

Bryum intermedium, Brid., is considered the nearest ally of *Br. pallescens* by Bruch and Schimper, from whom I quote the following diagnosis: "Quelque grande que soit la ressemblance, même dans les variétés, du *Br. pallescens* avec le *Br. intermedium*, ces deux espèces ne sauroient cependant pas se confondre, vu la différence dans la fleuraison. La première espèce se reconnaît en outre, et déjà à la première vue, à la couleur plus pâle de la capsule, dont l'opercule ne porte toujours qu'une pointe mousse très-courte, et se détache facilement quand le fruit est mis en contact avec l'humidité. Il faut encore remarquer que la capsule est toujours symétrique, et que son col n'est jamais courbé vers le bas, comme cela se voit si souvent dans le *Br. intermedium*; à l'état sec, même quand elle est encore fermée par son opercule, elle se trouve toujours rétrécie sous l'orifice. Le péristome est plus grand, et tous les fruits mûrissent à la même époque."

38. *Bryum pseudotriquetrum*, Schwægr. (*Br. ventricosum*, Dicks.; *H. and T.*)

Abundant on the rocky banks of streams, and in moist springy places on the mountains. I gathered numerous forms, varying chiefly

* I do not conclude from the accidental occurrence of androgynous flowers in a monoicous species, that the authors of 'Bryol. Eur.' have been altogether in error in adopting the inflorescence as a character for discriminating species: nature always refuses to be bound by our artificial rules, and there is no character *taken singly* which may not admit of exception. Sexual anomalies exist amongst flowering-plants as well as mosses: *e. g.* in the genus *Carex*, *Myrica* Gale, *Lychnis dioica*, *Bryonia dioica*, &c.

in habit and in the length of the capsule, but presenting no essential difference.

39. *Bryum turbinatum*, Swartz. Rocky situations near streams, but with fruit scarcely mature. A small and broad-leaved var. of this occurs below Winch Bridge, in which the tufts are beautifully zoned with red and purple, their upper portion being green. A similar var. of *Br. pseudotriquetrum* grows on Cronkley Fell.

40. *Br. Zierii*, Dicks. Basaltic rocks at the High Force, Holwick Scarr, Caldron Snout, &c., in moist shaded situations: the capsules immature at the time of my visit. The vinous tinge of the foliage on the lower part of the stem distinguishes this species at sight from *Br. argenteum* and *julaceum*.

41. *Ceratodon purpureus*, Brid. (*Didymodon*, *H. and T.*) Frequent.

42. *Cinclidotus fontinaloides*, Beauv. In the Tees.

43. *Climacium dendroides*, W. and M. (*Hypnum dendroides*, Dillen.; *Linn.*; *H. and T. Leskea*, *Hedw.*) Common.

44. *Dicranum Dillenii*, Tayl. MSS. (*D. scoparium* α . *vulgaris*, *Musc. Brit.*) Heaths and rocks; fruiting abundantly in Holwick Wood.

45. *D. flavescens*, Sm. Sides of streams, frequent.

46. *D. flexuosum*, Hedw. Heaths and moist rocks.

47. *D. fulvellum*, Sm. On stones near springs, between the base of Cronkley Scarr and the river: fruit very scarce.

48. *D. fuscescens*, Turn. *Musc. Hibern.* p. 60; *Engl. Bot.* t. 1490. *D. Sphagni*, *Wahl.* (*D. scoparium* γ . *Hook. in Engl. Flora.*)

On basaltic rocks below the High Force, Holwick Scarr and other places, but existing in the greatest abundance and perfection on Cronkley Scarr.

Dr. Taylor has well distinguished between *D. scoparium*, Hedw., and *D. Dillenii*, and I do not hesitate to assert that the *D. fuscescens* of Turner is equally distinct from both. In Teesdale, where *D. Dillenii* and *fuscescens* grow together on the same rocks, the difference in habit is so striking, that I am surprised any one should ever have thought of uniting them. The latter I would separate from the former by the following characters:—

Tufts more dense, darker-coloured, deep green above, fuscous below. *Leaves* secund or subsecund, slightly twisted in drying, lanceolate, tapering into a very long and slender acumination; *nerve much thicker*, in the upper half usually exceeding the breadth of the pagina on each side, which is not the case at all in *D. Dillenii**; reticulation *far smaller, punctate* in the upper portion of the leaf (the cellules being nearly equal in length and breadth), which is never the case in *D. Dillenii* (where the length

* In *D. Dillenii* the *nerve* has 3—5 dorsal ribs, the middle one of which is serrated near the summit and sometimes expanded into a lamina; but in *D. fuscescens* the *nerve* has only one rib at the back, which is serrated and extends a very little way below the summit of the leaf.

of the cellules always much exceeds their breadth). The *perichætal leaves* have broad sheathing bases (usually extending a very little above the *vaginula*), but are widely spreading upwards; whereas in *D. Dillenii* the inner perichætal leaves are remarkably convolute, broadly elliptical, with linear squarrose apiculi*, and the sheath which they form is *above twice the length of the vaginula*. Capsule ovato-cylindrical, subcernuous; lid curved, subulate from a conical base. In *D. Dillenii* the capsule is cylindraceous, nearly erect, with a subulate straight lid. Seeds deep olive, slightly larger than the brownish seeds of *D. Dillenii*. Teeth of the peristome shorter, deep red (almost black), opaque, cloven less than half way: in *D. Dillenii* tapering to a longer point, red at the base and tips but orange-yellow in the middle, cloven more than half way, often trifid.

I did not once observe the true *D. scoparium* in Teesdale. Its differences from *D. Dillenii* may be thus briefly stated:—Stems of far larger size and growing in looser tufts, mostly ascending from a decumbent base. Leaves more distant, of extraordinary length, uniformly falcato-secund, in the slender nerve and elongated cellules agreeing with *D. Dillenii*. The *perichætium* is still more remarkable than that of *D. Dillenii*, and frequently encloses several pedicels, which I have never seen to be the case in *D. fuscescens*. Capsules arcuate, substrumose.

49. *Dicranum glaucum*, Hedw. Heaths and rocks.

50. *D. heteromallum*, Hedw. Heaths and banks.

51. *D. squarrosum*, Hedw. Sides of streams; always barren.

52. *D. strumiferum*, Ehrh. On fallen rocks (basaltic) at the base of Holwick Scarr. The capsules appeared to have ripened prematurely (owing, probably, to the dryness of the season) and were for the most part imperfectly formed.

53. *D. varium*, Hedw. Common.

54. *Didymodon Bruntoni*, Arn. On basaltic rocks near the High Force, Cronkley Scarr, &c. The habit of this moss is very similar to that of *Weissia cirrhata*, along with which it grows; but the capsules of the latter were quite empty and dead, while those of the former were only beginning to shed their opercula.

55. *Did. capillaceus*, Schrad. Frequent, and in fine state, especially on moist basaltic rocks near Winch Bridge.

56. *Encalypta ciliata*, Hedw. On limestone rocks at the White Force, below High Force and in Ettersgill beck.

57. *E. streptocarpa*, Hedw. Limestone rocks and walls, but barren.

58. *Fissidens adiantoides*, Hedw. (*Dicranum*, *Musc. Brit.*) Hagg Syke.

59. *F. bryoides*, Hedw. Banks, chiefly in the lower grounds.

60. *F. tarifolius*, Hedw. Clayey and sandy banks.

* The stem-leaves of *Hypnum piliferum* are very similar in form.

61. *Fontinalis antipyretica*, L. In the Tees and its tributary streams.
 62. *Funaria hygrometrica*, Hedw. Frequent.
 63. *Grimmia apocarpa*, Hedw. Rocks and walls. In sandy spots overflowed by the Tees, the var. *rivularis* grows with closely tufted erect stems and leaves of extraordinary breadth.
 64. *G. pulvinata*, Sm. On walls, &c.
 65. *G. spiralis*, H. and T. Basaltic rocks at Caldron Snout and Falcon Clints, where it fructifies very sparingly.
 66. *G. torta*, Hornsch. Not unfrequent, either on the limestone or basalt, but occurring chiefly on loose stones in the more elevated situations, as at the base of White Force and Falcon Clints. Always barren.
 67. *G. trichophylla*, Grev. Abundant on walls between Barnard Castle and Middleton, and on rocks in Upper Teesdale.
 68. *Gymnostomum curvirostrum*, Hedw. On rocks near streams; chiefly on the limestone, but not confined to it.
 69. *Gym. Donianum*, Smith. On limestone rocks (below the basalt) on the Yorkshire side of the High Force, where it was discovered by Mr. R. B. Bowman. This minute moss grows in very small quantity, and its locality is exceedingly difficult of access, except when the river is low. Since observing it in this station I have gathered it in considerable quantity in Mowthorpe Dale near Castle Howard, where it grows in the crevices and on the under side of calcareous rocks, in company with *Hypnum tenellum* and *crassinervium*.
 70. *Gym. nimbosum*, Tayl. MSS. (*Zygodon Mougeotii*, B. and S.?) Rocks at the High Force, White Force and Cronkley Scarr.
 71. *Gym. rupestre*, Schwægr. Frequent on moist rocks; often growing in company with *G. curvirostrum*.
 72. *Hedwigia æstiva*, Hook. On moist basaltic rocks below the High Force, as well as in other similar situations. When the immense tufts which this moss usually forms are separated vertically, they often appear beautifully zoned, which I suppose is caused by the annual elongation of the stems.
 73. *Hookeria lucens*, Sm. On the west side of Mickel Fell.
 74. *Hymenostomum microstomum*, R. Br. (*Gymnostomum microstomum*, Hedw.; *H. and T.*) Upon a wall, topped with earth, below the High Force plantation.
 75. *Hypnum aduncum*, L. Bogs. In fruit on Cronkley Fell.
 76. *H. alopecurum*, L. Moist rocky situations.
 77. *H. catenulatum*, Schwægr. On stones in Holwick Wood.
 78. *H. commutatum*, Hedw. Abundant and in a fertile state on wet rocks.
 79. *H. confervoides*, Bridel? "Repens, ramis teretibus capillaceis, foliis erectis lato-lanceolatis enerviis, integerrimis; capsula suberecta, operculo obtuso."—*Schw. Suppl. t. 142; Drummond's Musci Americani*, No. 190.
- Growing intermixed with *Jung. trichophylla* on basaltic rocks in a shaded situation by the Tees' side below Winch Bridge. I observed only a single patch, destitute of capsules, but possessing *perichætia*.

Stems sparingly branched, not subpinnate as in *H. catenulatum* (its nearest congener). *Branches* nearly erect, of a beautiful pale green above, in their lower part with a slight tinge of pink. *Leaves* nerveless, slightly denticulate, more widely areolated (though far smaller in size), narrower, and tapering more upwards than those of *H. catenulatum*, yet not extending to so long a point as in *H. serpens*; they are equally patent, too, in the dry as in the moist state. *Perichætal leaves* deeply but unequally serrated.

This interesting moss bears so strong a resemblance to *H. serpens*, that, had I not been struck by its peculiar colour and remarkably neat appearance, I might have passed it over for that species. The characters above stated will suffice to show those who have studied *H. serpens* that *H. confervoides* is widely different from it in several essential particulars.

80. *Hypnum crassinervium*, Tayl., Wils. On limestone rocks by the Tees, near the foot of the High Force.

81. *H. cupressiforme*, L. Everywhere.

82. *H. curvatum*, Sw. Trees and rocks.

83. *H. cuspidatum*, L. Common.

84. *H. denticulatum*, L. Frequent in moist shady situations.

85. *H. filicinum*, L. Common, but rarely fructifying.

86. *H. fluitans*, L. In Hell Cleft.

87. *H. incurvatum*, Schrad. On stones at the base of the High Force, on the Durham side of the Tees; growing with *Orthotrichum rupestre*. I had nearly passed this over for *H. serpens*, which it certainly much resembles, especially in the form of its capsules. It is also not unlike *H. populeum*, with which species it grew intermixed.

88. *H. loreum*, L. Frequent.

89. *H. lutescens*, Huds. Limestone rocks in Ettersgill beck and Hell Cleft.

90. *H. molluscum*, Hedw. Frequent.

91. *H. multiflorum*, Tayl. On trees in Egglestone Wood and Balderdale. A *Hypnum*, which for the present I must consider a var. of this, grows in the fissures of limestone rocks in Hell Cleft, at the High Force, and other places; it is remarkable for the reddish hue of its foliage, in consequence of which I at first mistook it for *Leskea rufescens*. The leaves are longer and narrower than in the usual state of *H. multiflorum*, and when dry are striated.

92. *H. myosuroides*, Hedw. Common in rocky situations.

93. *H. palustre*, L. Wet rocks and on stones in streams, fructifying copiously.

94. *H. plumosum*, L. On rocks in and near streams.

95. *H. polymorphum*, Hedw. By the Tees below Winch Bridge; barren.

96. *H. populeum*, Hedw. Walls and rocks.

97. *H. prælongum*, Linn.

98. *H. proliferum*, L.

99. *H. purum*, L.

} Everywhere common.

100. *Hypnum rugulosum*, Web. This has been found by Mr. Ibbotson on the limestone above Falcon Clints; but as I only searched the base of those rocks, I did not observe it.

101. *H. ruscifolium*, Neck. Streams, frequent.

102. *H. rutabulum*, L. Everywhere.

103. *H. Schreberi*, Willd. Heaths.

104. *H. scorpioides*, L. Bogs.

105. *H. sericeum*, L. Walls, trees and banks.

106. *H. serpens*, L. Everywhere.

107. *H. splendens*, Hedw. Heath sand rocks.

108. *H. squarrosum*, L. Common.

109. *H. stellatum*, Schreb. Bogs, frequent. Var. β . *minus*, on a wall near Lonton, in fruit.

110. *H. striatum*, Schreb. Banks.

111. *H. triquetrum*, L. Frequent.

112. *H. uncinatum*, Hedw. Abundant on stones and about the roots of trees, with fruit in excellent condition.

113. *H. undulatum*, L. Shady places, not common.

114. *H. velutinum*, L. Common.

115. *Leskea complanata*, Hedw. (*Hypnum complanatum*, *Musc. Brit.*) Frequent.

116. *L. pulchella*, Hedw. Frequent among rocks in shaded situations. In Teesdale this elegant moss is almost constantly associated with *Bryum crudum*.

117. *L. trichomanoides*, Hedw. About the roots of trees; not common.

118. *Leucodon sciuroides*, Schwægr. Trees between Barnard Castle and the High Force inn.

119. *Meesia uliginosa*, Hedw. (*Bryum trichodes*, L.; *H. and T.*) Very sparingly on moist basaltic rocks at Winch Bridge.

120. *Mnium hornum*, Hedw. (*Bryum*, *Musc. Brit.*) Frequent.

121. *M. marginatum* (*Mn. serratum*, *Brid.*; *Bryum marginatum*, *Dicks.*; *H. and T.*) In rocky situations.

122. *M. punctatum*, Hedw. Near streams.

123. *M. rostratum*, Schwægr. Rocks in Ettersgill beck, in fruit. Below Winch Bridge.

124. *M. undulatum*, Hedw. (*Bryum ligulatum*, *Schreb.*; *H. and T.*) Frequent.

125. *Neckera crispa*, Hedw. Common on rocks.

126. *N. pumila*, Hedw. On trees in Holwick Wood.

127. *Orthotrichum affine*, Schrad. Trees and walls.

128. *O. anomalum*, Hedw. Frequent on limestone rocks and walls. The capsules had passed the season of maturity, and were therefore in an unfit state for observing the *cilia*; but by attentively watching this moss on a wall near Castle-Howard during the last three summers, I have satisfied myself that *well-developed capsules* usually possess an inner peristome. I have arrived at the same conclusion respecting *O. cupulatum*; but in the latter the *cilia* are 16, in the former only 8.

129. *O. crispum*, Hedw. On trees, with *O. Drummondii*.

130. *Orthotrichum cupulatum*, Hoffm. In the same localities as *O. anomalum*.

131. *O. diaphanum*, Schrad. Trees and walls, between Barnard Castle and Middleton.

132. *O. Drummondii*, Hook. This beautiful species is more abundant in Upper Teesdale than any other of the genus, and may be met with everywhere on shrubs and young trees. I observed it in the greatest plenty and luxuriance on junipers near the High Force, and on birches by the side of Blea beck and on Cronkley Fell.

The existence of an *annulus* at the mouth of the capsule in the genus *Orthotrichum* appears to have escaped the notice of every writer on the subject of bryology: even Bruch and Schimper, whose investigations have been so minute and elaborate, have failed to detect it. To Mr. Wilson is due the credit of first observing this organ in the capsules of *O. cupulatum*, sent to him by myself from the neighbourhood of York, in May 1842. At that time we thought it might be peculiar to the species, but I have since ascertained its presence in nearly every British species of the genus; and I may mention *O. Drummondii* and *crispum* as mosses in which it may be easily detected. In all cases it is best seen by bending the teeth of the peristome inwards and cutting them away, or by carefully taking out the inner membrane of the capsule, of which the peristome forms the continuation.

The *annulus* of *O. Drummondii* is very narrow, closely appressed to the teeth of the peristome, of which it partakes the hue, so that unless they be first removed, it is almost certain to be overlooked. It is divided into processes, of which *two* subtend each tooth, so that the whole number of processes is thirty-two: they are obtuse, sometimes perforated, and of very fragile texture.

133. *Orthotrichum leiocarpum*, B. and S. (*O. striatum*, Hedw.; *H. and T.*) Frequent on trees.

Bruch and Schimper assign the following very adequate reason for changing the name of this species: "Comme c'est la seule espèce du genre *Orthotric* qui ait *une capsule dépourvue de raies*, nous l'appelons *O. leiocarpum* (à fruit lisse) en rejetant la dénomination '*striatum*,' qu'on avait conservé jusqu'ici."

134. *O. Lyellii*, H. and T. On trees in many places, but barren.

135. *O. pulchellum*, Sm. On trees near streams; frequent. In Hell Cleft I found a large var. growing on a stone, with a longer capsule and paler outer peristome than ordinary.

136. *O. rivulare*, Turn. On stones in the Balder; rare. The leaves of specimens gathered in this locality are remarkably denticulated at the apex; but this peculiarity exists also, though in a less degree, in specimens from Dr. Greville, gathered in Glen Dochart.

137. *O. rupestre*, Schleich. (*O. rupicola*, Funk.; *H. and T.*) On fallen rocks and stones at the base of the High Force.

138. *O. stramineum*, Hornsch. "Monoicum, subpulvinatum; caule

ramoso; foliis patulis, siccitate laxè imbricatis, lanceolatis, costato-carinatis, margine reflexis; capsula pyriformi-oblonga, late striata, e lutescente fusca; calyptra campanulata, subpilosa; dentibus 8 bigeminatis, ciliis 8 æqualibus vel 16 alternis brevioribus."—*Bryol. Eur.*

O. stramineum, *Hornsch. ined. Brid. Bryol. Univ. i. p. 789.*

On an ash-tree near the bridge across the Lune, between Mickleton and Lonton; very scarce.

From *O. affine*, growing on the same tree, this differs as follows. *Leaves* usually of a deeper green. *Vaginula* clothed with remarkably long hairs, which often reach half-way up the capsule; but naked in *O. affine*. *Capsule* much shorter and wider, with a shorter neck, thick-skinned, the areolation wider, especially near the mouth, the 8 striæ with which it is marked far broader. *Calyptra* straw-coloured, more convex, concealing two-thirds of the capsule (in *O. affine* only half). *Operculum* shorter. *Cilia* consisting of fewer cellules. *Seeds* green; in *O. affine* pale brown.

My specimens uniformly show 16 cilia, but Bruch and Schimper remark: "Le nombre des cils du péristome intérieur varie de 8 à 16, et on trouve souvent des échantillons où cette variation a lieu sur le même individu."

O. pallens, Bruch, which I have found near York, agrees with *O. stramineum* in the number of cilia, but differs in its obtuse upper leaves and their wider areolation, smooth vaginula, smaller calyptra and elongated capsule.

139. *Phascum alternifolium*, Schwægr. On a turf-capped wall below the High Force plantation.

I cannot satisfy myself that this is specifically distinct from *Ph. subulatum*, Hedw. The character which appears to be chiefly relied on for their separation in the 'Bryol. Europ.' is founded on the male inflorescence; the *antheridia* in the former being enclosed in *gemmæ* dispersed along the stem, and in the latter free in the axils of the perichæatial leaves. I must trust to future observation to decide whether or not this difference is to be accounted specific.

140. *Physcomitrium ericetorum*, De Notaris. (Gymnost. fasciculare, *H. and T.*) Caldron Snout.

141. *Polytrichum aloides*, Hedw. Frequent.

142. *P. alpinum*, L. Abundant in heathy situations.

143. *P. commune*, L. Heaths.

144. *P. gracile*, Menzies. Near Lower Cronkley.

145. *P. juniperinum*, Willd. Heaths.

146. *P. nanum*, Hedw. In several places.

147. *P. piliferum*, Schreb. On the moor between the High Force inn and Cronkley Bridge.

148. *P. undulatum*, Hedw. Common.

149. *P. urnigerum*, L. Near the High Force inn.

84 Mr. R. Spruce *on the Musci and Hepaticæ of Teesdale.*

150. *Pottia truncata*, B. and S. (*Gymnostomum truncatulum*, *Musc. Brit.*) In cultivated ground.

151. *Pterogonium gracile*, Sw. Falcon Clints; barren.

152. *Splachnum maioides*, L. fil. On fallen rocks at the base of Holwick Scarr; between Cronkley Scarr and the Tees; Meldon Hill, on the Westmoreland side of Maize beck.

153. *Tetraphis pellucida*, Hedw. Hagg Syke; Hell Cleft, &c.

154. *Tetradontium Brownianum*, Schwagr. (*Tetraphis Browniana*, *Grev.*; *H. and T.*) On the underside of stones near Caldron Snout.

155. *Trichostomum flexicaule*, B. and S. (*Didymodon*, *Brid.*) Abundant, both on the limestone and basalt. This is a moss which I had concluded from previous observation to be confined exclusively to limestone and chalk formations; but it certainly does not refuse to grow on the basalt, in Teesdale.

156. *Tr. rigidulum*, Smith. (*Didymodon rigidulum*, *Hedw.*; *H. and T.*) Near streams.

The five following species are not included in *Trichostomum*, as limited by Bruch and Schimper.

157. *Tr. aciculare*, Beauv. Abundant.

158. *Tr. fasciculare*, Schrad. Frequent on rocks and stones.

159. *Tr. heterostichum*, Hedw. Rocks and walls.

160. *Tr. lanuginosum*, Hedw. Abundant. Among the mountains the rocks and stones are frequently quite hoary with this moss.

161. *Tr. microcarpum*, Hedw. Falcon Clints; scarce.

162. *Weissia acuta*, Hedw. Plentiful on basaltic rocks by the Tees at Winch Bridge and other places.

163. *W. cirrhata*, Hedw. On Holwick and Cronkley Scarrs.

164. *W. controversa*, Hedw. Banks.

165. *W. curvirostra*, H. and T. On walls and rocks, as well as in moist sandy situations.

166. *Zygodon lapponicus*, B. and S. (*Gymnostomum lapponicum*, *Hedw.*; *H. and T.*) Fissures of basaltic rocks at Caldron Snout; in fruit.

167. *Z. viridissimus*, Brid. (*Gymnostomum viridissimum*, *H. and T.*) On trees between Barnard Castle and Middleton; on rocks in Balderdale.

Hepaticæ.

1. *Fegatella conica*, Tayl. Near streams.

2. *Jungermannia albicans*, L. Everywhere.

3. *J. asplenoides*, L. Frequent in the low grounds; scarcely ascending to the subalpine regions.

4. *J. Bantriensis*, Hook. MSS. Caule erecto vel adscendente, subramoso; foliis ovato-rotundatis, obtuse emarginatis, perichætialibus conformibus; stipulis parvulis, lanceolato-subulatis, integerrimis, basi 1-2 dentatis, bifidis, vel laciniatis; fructu terminali, calycibus subcylindricis, ore angustiori tubulato ciliato.

J. Bantriensis, Hook. MSS. olim*. *J. bidentata*, var. *Brit. Jung. Synops.* p. 16. *Suppl.* tab. 3.

* I should have scrupled to retain Hooker's specific name, had it not

On sandy deposits by the Tees and its tributary streams; in the greatest abundance below Winch Bridge. Sides of springs on the summit of Cronkley Fell.

Var. *β. minor*, foliis minutis, e basi latiori, subdistantibus. By the Tees near Winch Bridge and the High Force.

Var. *γ. muscicola*, surculis prostratis, foliis angustioribus subhorizontalibus. Creeping over mosses on moist rocks below the High Force.

This I believe to be the plant alluded to by Hooker in his monograph under *J. stipulacea* (*J. scutata*, W. and M.), in these terms: "A new species (*J. Bantriensis*, MSS.), which has lately been discovered by Miss Hutchins, and which has, like the present, emarginate leaves: but it differs in its much greater dimensions, in the less concave, obtusely and slightly emarginate leaves, in the small stipules, and in the situation of the calyx, rising quite leafless at the base from the upper side of the stem, as that of *J. pusilla* does." And it is very probable that the plant mentioned afterwards on the same page as having been found in Scotland by Mr. Lyell, and possessing considerable affinity with *J. stipulacea*, but differing in its twice or thrice larger leaves and their obtuse segments, is specifically the same. There is yet another *supposed species* mentioned in the same work (under *J. bidentata*), communicated also from Bantry by Miss Hutchins, and "distinguished from *J. bidentata* in having the leaves cut into three more frequently than into two segments; and in either case they are very distinctly, but irregularly toothed," which I am inclined to unite with the other two. If this opinion be correct, Hooker's remarks plainly indicate a very polymorphous species. Of these three plants, the two latter are never afterwards alluded to in the 'Brit. Jung.,' but *J. Bantriensis* is finally disposed of at page 16 of the Synopsis as a variety of *J. bidentata*, and a figure of the calyx and upper portion of the stem is given in the third supplementary plate. That my plant is the *J. bidentata* var. *Bantriensis* of Hooker has been assured to me by Dr. Taylor, who has kindly compared it with an original specimen from the late Miss Hutchins; and having had excellent opportunities in Teesdale for studying it in its various forms, I am bound to declare that it is truly distinct from both *J. bidentata* and *scutata*, as the following diagnosis will amply demonstrate:—

Plants forming dense tufts or patches; in habit much resembling *J. cordifolia*.

Stems mostly erect, flexuose, simple or sparingly and dichoto-

been already published by Lindenberg and Nees in the 'Species Hepathicarum' (as I am informed by Dr. Taylor); although these authors appear to have been unacquainted with the plant, and to have presumed on its being distinct merely from Hooker's brief account of it.

mously branched, with suberect branches; yet sometimes exhibiting a laxer and procumbent mode of growth, with divaricating branches; always, however, distinct from the entangled and much-branched stems of *J. bidentata*. They vary almost indefinitely in size, but in the normal form equal *J. bidentata* and far surpass *J. scutata*.

Leaves secund, far rounder in outline and attached to the stem by a narrower base than those of *J. bidentata* (which are nearly horizontal in insertion and direction), gradually increasing in size from the base to the summit of the stem, the terminal ones (on the larger stems) three times the size of the lowest; all emarginate or (more rarely) tridentate, with obtuse, acute or apiculate segments; the lower with a lunulate sinus and entire margins; the upper subacutely and often irregularly emarginate, angular or toothed at the margins. The areolation a little wider than in *J. bidentata*. The colour varies from yellowish green to deep olive, but is never whitish, as we most frequently see it in *J. bidentata*. The leaves of the branches and innovations are narrower, more deeply and acutely cloven than the rest; and on the procumbent stems they are seldom secund, but merely incurved or even horizontally patent.

Stipules minute, seldom broader than the stem, exceedingly polymorphous, yet usually lanceolato-subulate, with one or more lateral teeth, sometimes quite entire, more rarely bifid or lacinate, often subfalcate but never *twisted*. Occasionally they appear to be quite rudimentary, and are not seldom altogether wanting, especially in the lower half of the stem. In nearly all these particulars they offer a perfect contrast to the *unusually large* and ovato-acuminate stipules of *J. scutata*.

Inflorescence dioicous. The *male plants* grow in separate tufts; the stems are antheriferous in their upper half, and the *perigonial leaves* are acutely divided at the summit into three *incurved* unequal teeth, the lowest tooth being the smallest; each leaf encloses 1—4 anthers, most frequently the latter number. But in *J. bidentata* the perigonial leaves are *recurved* in their upper half, and have an involute lobe at the base which contains the anthers. I have not seen perigonia of *J. scutata*, nor were they known to Hooker.

Female flower terminal, destitute of any *proper* perichætium. The *calyces* which contain only pistilla are pyriform* (as repre-

* An extensive examination of *barren calyces* will bring to light a great variety of forms, but this I attribute to the imperfect state of development they often exhibit; I have even seen them wide-mouthed and almost campanulate, when they plainly betray their origin to be derived from the union of leaves in all respects similar to those of the stem, for the bi- or tridentate apices of the latter are distinctly visible. I have observed similar circumstances in other *Jungermannia*, especially *J. ventricosa* and *obtusifolia*, and

sented in 'Brit. Jung.' Suppl. t. 3), but when fully grown and fruit-bearing nearly cylindrical, depressed at the summit and terminating in a narrow tubular ciliated mouth, which is from one-fifth to one-sixth the length of the calyx: after the emission of the capsule, lacinated. They are entirely destitute of plicæ or furrows, the transverse section being always circular. The cellules of the tubular mouth are remarkable for being more elongated than the rest, and the terminal ones, which constitute the cilia, are longest of all; whereas in *J. bidentata*, however much the calyx may be lacinated and toothed, *the terminal cellules are always the smallest*. [The fructification of *J. scutata* offers excellent marks of distinction from *J. Bantriensis*: it is *lateral*, with a *perichætium* consisting of 2—6 leaves, entire or variously cut at the extremity, and *far smaller than the stem leaves*; and the calyx is obovate with a trigonous denticulated mouth.]

Calyptra obovate, much narrower than the calyx and *perfectly free*; but in *J. scutata* it is of equal width with the calyx, and *adheres to its sides*.

Peduncle incrassated, thicker than that of *J. bidentata*. *Capsule* smaller, more nearly spherical, its valves of a deep purplish brown hue, but in *J. bidentata* of a light brown. *Seeds* slightly smaller, and spiral filaments much shorter than those of *J. bidentata*.

In *var. β*. the stems are many times smaller than in the normal form (though intermediate states occur) and of a loosely cellular texture. Leaves broader than long, from a wide base, usually with a shallow triangular emargination; the areolation slightly wider than in the normal form. Stipules so minute as to be detected with great difficulty.

Var. γ, which is also of humble size, has almost exactly the habit of *J. excisa*, and might be mistaken for it if the stipules were not observed. The stems are prostrate, subramose, opaque. Leaves almost horizontal, proportionally longer and subquadrate, with a closer areolation. Stipules more uniform, yet occasionally bifid. I found *gemmae* on this variety alone: the leaves which bear them are closely imbricated at the extremity of a shoot, of delicate texture, remarkably lacinated and erose, reddish as well as the *gemmae* themselves, which are almost spherical in shape. The stipules which accompany the gemmiferous leaves are of unusual size, being scarcely smaller than the leaves themselves.

All the states of this species are remarkable when growing, or if moistened after having been dried, for their strong and rather

the former of these perhaps owes its rank of a species to its having been first observed with barren calyces *only*; at least I search in vain for any permanent character to distinguish it from *J. excisa*.

agreeable scent; very different from that of *J. bidentata*, but not unlike that of *J. hyalina*. Dr. Taylor likens it to "recently cut cedar-wood with a dash of sweet-briar."

Although *J. bidentata* and *scutata* are the nearest allies of *J. Bantriensis*, yet there are other species which approach closely to it, amongst which are *J. barbata*, Schreb., *J. Lyoni*, Tayl., and *J. saxicola*, Schrad.; but as the differences are obvious enough to any one acquainted with these species, it is needless to enter into an exposition of them.

I ought to add that Mr. Wilson has favoured me with specimens of what I consider to be a state of *J. Bantriensis*, gathered by Mr. Ralfs near Dolgelley, in September last. It differs from the normal form only in its laxer habit, more distant and sub-patent leaves.

5. *Jungermannia barbata*, Schreb. Frequent, especially near the High Force; usually intermixed with mosses.

6. *J. bicuspidata*, L. Everywhere.

7. *J. bidentata*, L. Common; but not ascending the mountains.

8. *J. byssacea*, Roth. In several localities. Few *Jungermanniæ* are more various in their hues than this little species: in Hell Cleft it gives to the large patches of *Barbula tortuosa* which it infests the appearance of being strewed with soot; near Maize beck it imparts a pinkish tinge to *Dicranum glaucum* and other palustrous mosses; growing on the earth near the High Force, its colour is a deep green. In the last-named locality the stems exhibit stipules, which are very minute, ovate and entire towards the base of the stems, but bifid in the upper part. Stipulaceous varieties of *J. byssacea* are not unfrequent near York, and might be mistaken for *J. Francisci*, Hook., which is however a perfectly distinct species.

9. *J. ciliaris*, L. Very sparingly on Cronkley Fell. This usually alpine species flourishes in abundance on all our moors in the Vale of York, where its constant companion is *Cetraria Islandica*.

10. *J. concinnata*, Lightf. On rocks south-east from Cronkley Bridge, and more abundantly at the base of Holwick Scarr.

11. *J. cordifolia*, Hook. In streams on the west side of Mickley Fell; on wet rocks near the Tees, in various places.

12. *J. Dicksoni*, Hook. Cronkley Scarr and rocks south-east of Cronkley Bridge, but very scarce.

13. *J. dilatata*, L. On trees.

14. *J. echinata*, Tayl. MSS. On limestone rocks in Hell Cleft, Ettersgill beck, and on the Yorkshire side of the High Force. I have seen *J. hamatifolia*, Hook., its near congener, in precisely similar situations on slate and old-red-sandstone rocks in the south-west of Ireland.

15. *J. emarginata*, Ehrh. Abundant in moist rocky situations, especially near streams.

16. *J. epiphylla*, L. Near streams.

17. *J. excisa*, Dicks. In many places.

18. *J. furcata*, Linn. Rocks and trees.

19. *Jungermannia incisa*, Schrad. Near Maize beck.
20. *J. inflata*, Huds. In heathy places.
21. *J. laxifolia*, Hook. At the base of the High Force; very scarce.
22. *J. Lyellii*, Hook. I found a single plant by the Tees near Winch Bridge.
23. *J. Lyoni*, Tayl. MSS. Cronkley Fell and Holwick Wood.
24. *J. multifida*, L. On moist rocks among mosses; fructifying in several places.
25. *J. nemorosa*, L. In a great variety of situations.
 Var. β . *purpurascens*, in Hell Cleft.
 Var. γ . *recurvifolia*, on rocks near streams.
26. *J. pinguis*, L. In bogs and near streams.
27. *J. platyphylla*, L. Rocks.
28. *J. polyanthos*, L. On stones in the bed of the Balder.
29. *J. pubescens*, Schrank. Frequent on rocks (chiefly limestone) near the Tees and its tributaries. I found *perigonia* in abundance, but no *calyces*, though I searched most minutely.
30. *J. reptans*, L. Cronkley Scarr; very sparingly.
31. *J. riparia*, Tayl. MSS. Sides of streams; not common.
32. *J. scalaris*, Schrad. Frequent in moist situations.
33. *J. serpyllifolia*, Dicks. Near the High Force, Hell Cleft and other places, yet nowhere abundant.
34. *J. setacea*, Web. Heathy situations near Maize beck and Cronkley Scarr.
35. *J. spinulosa*, Dicks. Near the High Force and Caldron Snout, but rather rare.
36. *J. Tamarisci*, L. On rocks and about the roots of trees.
37. *J. Taylори*, Hook. Cronkley Scarr and the west side of Mickel Fell.
38. *J. Trichomanis*, Dicks. Frequent.
39. *J. trichophylla*, L. Abundant in moist situations.
40. *J. undulata*, L. Maize beck. Dr. Taylor's opinion that this is only a variety of *J. nemorosa* ('Flora Hibernica,' part ii. p. 61) is, I fear, too well founded.
41. *Marchantia androgyna*, L. Exceedingly abundant on rocks by the Tees, Ettersgill beck, and other streams.

Collegiate School, York, Nov. 15, 1843.