CLEVELAND

Naturalists' Field Club.

Record of Proceedings

1889

OFFICERS 1889.

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RECORD OF PROCEEDINGS, 1889.

THE SEASON of 1889 was one of the most successful which the Club has experienced. The membership was materially increased, reaching 65 at the close of the season. The excursions were all well attended, and generally an amount of useful work done, which could not fail to have benefited the members. The season was particularly favourable for Botanical work, the vegetation, especially in the spring, being more luxuriant than for many years past. The following excursions were undertaken:

May 25 --- Battersby to Kildale.
June 8-10 ---Richmond.
June 22 --- Ingleby Greenhow.
July 6 ---Ayton.
July 13 ---Dinsdale.
August 3-5 ---Upper Teesdale.
August 17 ---Eston Nab.
September 7 --- Staithes to Runswick.

BATTERSBY TO KILDALE, MAY 25. Thirteen members attended this excursion, which, considering the threatening state of the weather, was very satisfactory. During the afternoon about 70 different plants were found in flower, including *Orchis mascula, Orchis maculata, Habenaria viridis, Pedicularis palustris, Geum rivale, &c.* The geologists, ornithologists, and conchologists had also ample scope for their investigations.

RICHMOND, JUNE 8-10. This was one of the best-attended three days' excursions, which has been held in connection with the Club, nine members being present during the whole of the three days. The King's Head Hotel was fixed upon as the headquarters. On Saturday afternoon the ruins of Easby Abbey were visited, the woods *en route* being investigated by the botanists and conchologists. In the evening Richmond Castle was inspected. The weather on Sunday being unfavourable, the members contented themselves with visiting the Museum and making short excursions between the showers. On Monday Marske was visited. About 130 plants in flower were discovered during the three days.

INGLEBY GREENHOW, JUNE 22. There was a good attendance of members at this excursion, about twenty ladies and gentlemen being present. Time did not permit of a visit to the hills, so that the geologists of the party had a blank day. Nearly 90 plants were found in bloom.

AYTON, JULY 6. This was an excursion arranged specially for inspecting the Cleveland Dyke, and hearing a paper read upon it by the President (Dr. Veitch), a copy of which is appended. After the paper had been read and shortly discussed, Roseberry and its environs were examined. The botanists succeeded in securing specimens, in bloom, of *Drosera rotundifolia, Veronica scutellata, Listera cordata,* and many other plants.

DINSDALE, JULY 18. The excursion to this favourite place was chiefly remarkable for the discovery of a specimen of *Oxalis corniculata.* This plant, so far as can be ascertained, has not previously been recorded in the district, and this specimen was probably an escape from a garden.

UPPER TEESDALE, AUGUST 3-5. This visit to Upper Teesdale was made to coincide with the visit of the Yorkshire Naturalists, to whose Union the Cleveland Field Club is affiliated. The excursion proved most enjoyable and successful. It being late in the season, the *flora* had for the most part passed the flowering stage. The *Potentilla fruticosa,* however, was in full bloom on the banks of the river. The *Galium boreale, Parnassia palustris* and *Saxifraga aizoides* were also noticed.

ESTON NAB, AUGUST 17. The Party took train to Nunthorpe, and, after proceeding along the Guisborough road for a short distance, climbed the hillside and crossed, the moor to the Nab, after which the walk was extended to Guisborough.

STAITHES TO RUNSWICK, SEPT. 7. This proved to be one of the most interesting excursions of the season. The original intention of the party was to take the shore route from Staithes to Runswick Bay, but owing to the state of the tide, it was only possible to do part of the journey by the shore, the cliffs having to be resorted to for the remainder. A few of the bolder spirits of the Party, led by fisher-boys as guides, took the path along the ledges on the cliffside from Staithes, but the others chose firmer and higher ground.

DREDGING EXCURSION, OCTOBER 3. Through the kindness of the Port Sanitary Authority, a few members of the Club were enabled to do a little dredging on the afternoon of Thursday, October 3, about the Tees Breakwater and off Redcar, and the thanks of the Club are due to the above named authority for the loan of their Steam Launch. Three casts were made with a Bowerbank dredge, capturing the following *fauna*:

ZOOPHYTA—*Thuiaria articulata, Cydippe infundibulum,* a few common echinoderms.

CRUSTACEA—*Cirolana Cranchii, Podocerus pulchellus, Gammarus locusti, G. pulex, Thysanopoda Couchii, Mysis chamaeleon, Palaemon squilla, Crangon vulgaris, Paguius laevis*? and *Pinnotheris pisum.*

POLYZOA—*Flustra papyracea, Tubulipora lobulata, and Bugula plumosa.*

TUNICATA—*Leptoclinum maculosum.*

CONCHIFERA—Shell of *Teredo Nowegica,* together with numbers of the commonest mollusca.

The weather being delightful, all present thoroughly enjoyed this interesting excursion.

GEOLOGICAL NOTES,
BY W. Y. VEITCH.

MAY 25. On the way from Battersby to Kildale up the lovely dale were examined portions of the lower lias, traced *Ammonites Capricornus* beds up to the waterfall, known locally as Old Meggison, and then came upon the lower sandstone of the Marstone series of Phillips—*Ammonites Margaritatus* zone, —which were followed up until the *Ammonites Spinatus* beds were made out, here and there along this footpath evidences of this rock were apparent. Close by are abandoned workings of ironstone sinkings, the thickest seam here is—

	Ironstone 2 feet 9 inches.
5 feet 4 inches	Shale 1 feet 1 inch
	Ironstone 1 feet 6 inches

From the railway a glimpse was obtained of the most interesting peat beds of the district, from the sandy beds underneath this peat horns have been obtained of *Cervus elaphus* and *Cervus tarandus* (Red-deer and Rein-deer).

JUNE 10. The visit to Richmond gave the Club an opportunity of observing the Yoredale Rocks of those parts, and of admiring the bold terraces of mountain limestone scenery clothed in every ravine with rich woodland. The Castle is situated upon the top of the main limestone, 150 feet above the bed of the river Swale, which in its turn is 300 feet above sea level. It thus appears that the main limestone has sunk 1,250 feet from its height (1,700) at the Nine Standards Rigg.

The Ingleby Greenhow trip, on June 22, being a very short one, no chance for Geological research happened.

JULY 6. Ayton was visited; the outlying character of Roseberry, the Gravel Beds of the neighbourhood, the carving out by glacial action and the intrusive igneous rock were duly noticed. A paper on “The Cleveland Dyke " was read by the President of the Club, which elicited a most interesting discussion, Messrs. Burton, Meek, Charlton, Thomas, &c., taking part in it, the thanks of the meeting was given to the writer of the paper, and it was resolved to publish it and forward copies to the Members of the Club.

The 13th JULY Meeting was held at Dinsdale, only the new red sandstone and the fact that sulphurous water is pumped out of it at the Spa, probably from gypsous marl, interested the Geologists.

At a hurried trip from Staithes to Runswick on September 7 the coast section as far as Port Mulgrave was examined, and many specimens were obtained characteristic of the rocks, exposed and others thrown up by the sea. Among them were:

Ammonites margaritatus

A. spinatus

A. annulatus
A. communis
A. bifrons
A. defossum
A. capricornus
Dentalium giganteum
Pecten equivalvis
Cardium truncatum
Inoceramus dubius
Chordophyllites cicatricosus
Nulliporites sp.

ORNITHOLOGICAL *A*ND OTHER NOTES, BY R. LOFTHOUSE.

MAY 25, EXCURSION FROM BATTERSBY TO KILDALE. The following birds were noticed: Migrants : Chiffchaff, Sedge Warbler, Willow Wren, Wood Wren, Whitethroat, Cuckoo, all in song; Swift, Sand Martin, Swallow, House Martin, there were numbers of nests of the latter under the eaves of the railway station; Residents: Blackbird, Yellow Hammer, Chaffinch, Thrush, Wood Pigeon. On a former excursion to Kildale, the beautiful, and locally distributed, Pied Flycatcher was observed, and also on another occasion near Ingleby. I have no doubt it breeds here. Clarke and Roebuck, in their Handbook of the Vertebrate Fauna of Yorkshire, mention a Heronry as existing at Kildale, I never could find out when or where this Heronry was located. A Redwing, a bird seldom known to nest in the British Isles, is recorded as having nested at Kildale in 1840. The animals noticed were numbers of Rabbits and a Squirrel, an animal by no means common in Cleveland.

JUNE 8 TO 10**,** EXCURSION TO RICHMOND AND NEIGHBOURHOOD. — The following birds were noticed: Migrants: Whitethroat, Willow Wren (numerous), Chiffchaff (nest found containing six eggs), Sedge Warbler (not very numerous), Landrail, Cuckoo, House Martin, Swallow, Sand Martin, Swift, very numerous, as might be expected, it is an ideal place for them, we watched them soaring high over the castle walls until late into the night when all the other birds had long since retired to rest. Wheatears and Pied Wagtails were met with on the stony ground at the foot of Whitcliffe. Residents: Jay (noticed in Whitcliffe Wood), Meadow Pipit, Chaffinch, Hedge Sparrow, Rook, young birds fully fledged.

JUNE 29, EXCURSION TO AYSGARTH. The following birds were observed Migrants: Swift, Sand Martin, Chiffchaff (nest with eggs found), Yellow Wagtail, Common Sandpipers (abundant). Residents: Dipper (several observed), Blackbird. In the River Yore here Crayfish are common, and fine Trout and Grayling are found; the Miller's Thumb (*cottus gobio)* is also abundant and grows to a large size. The Yore is a favourite river for otters, and otter hunts often take place in the proper season.

JULY 13, EXCURSION TO DINSDALE DAM. Dinsdale Dam appears to be from 6 to 8 feet high, and must be a pretty effectual barrier to fish getting up the river. There is, however a fish pass at one side. Small Salmon, or Salmon Trout, were trying to ascend while we were there, but there was not much water, and we saw none succeed, although one came within about a foot of the top. The river contains, besides Salmon, Salmon Trout, Trout, Roach, Dace, Eels, Flounders (at Middleton), and Gudgeon, of which last we saw a goodly number that had been caught by some youthful followers of the gentle craft. The birds noticed, besides the commoner species, were the Kingfisher and Wheatear.

CONCHOLOGICAL AND OTHER NOTES. BY T. A. LOFTHOUSE.

EXCURSION FROM BATTERSBY TO KILDALE, 25TH MAY. The following land shells were noted: —*Zonites alliarius, Z. cellarius, Z. fulcus*, *Z. nitidulus, Helix nemoralis,* and v*ar. libellula, H. arbustorum, H. sericea*, *H. hispida, H. fusca, H. caperata, H. rotundata, Clausilia rugosa, C. laminata* and *Bulimus obscurus.* The most notable find was that of *Helix fusca,* a shell of rather uncommon occurrence. On a former excursion the following were found in addition to the above: *Succinea putris, Vitrina pellucida, Zonites crystallinus* and *Zua lubrica.*

In *Lepidoptera* a specimen of Scalloped Hazel *(Odontopera bidentata)* was caught, and the larva of Green Brindled Crescent *(Miselia Oxyacanthae)* found.

At the excursion to the same district on the 25th of August 1888, the following insects were noticed: Green-veined White (*Pieris napi).* Meadow Brown *(Satyrus jurtina),* Small Heath (*Chortobius pamphilus),* and the larvae of the Red Admiral *(Vanessa atalanta)* found, Yellow Shell *(Camptogramma bilineata),* Dark Marbled Carpet *(Cidaria immanata),* Barred Yellow (*Cidaria fulvata),* Barred Straw (*C. pyraliata),* and the Small Mallow *(Eubolia mensuraria)*.

EXCURSION TO RICHMOND AND DISTRICT, JUNE 8-10. In rather damp weather, favourable for shell collecting, the following species were found: —*Vitrina pellucida*, *Zonites cellarius, Z. radiatulus, Z. alliarius, Z. nitidulus*, *Z. crystallinus, Helix aspersa* (very fine on Castle banks), *H. arbustorum, H. hortensis* and *var. lutea, H. sericea, H. fusca, H.* h*ispida, H. rufescens, H. rotundata, H. rupestris, H. pulchella, Bulimus obscurus, Clausilia rugosa* and *var.dubia, Pupa umbilicata, Zua lubrica.* The only freshwater shell found was *Limnaea truncatula.*

The weather, being damp and cold, made it very unfavourable for collecting insects in a district noted for its Lepidopterous fauna. The only specimens seen were the Large White (*Pieris brassicae)* Small White *(Pieris rapae),* Green-veined White (P. *napi),* Orange Tip *(Anthocharis cardmines*). Common Swift (*Hepialus lupulinus),* Silver-ground Carpet (*Melanippe*

montanata). The caterpillars of the Winter Moth (*Chimatobia brumata)* and the July Highflyer *(Ypsipetes elutata)* were found.

EXCURSION TO AYRSGARTH, JUNE 29. Notwithstanding the long continued drought of this month, everything being dried up, the following shells were found: *Succinea putris, Vitrina pellucida, Zonites nitidulus, Z. alvarius, Helix arbustorum, H. sericea, H. caperata, H. lapicida, H. rufescens, H. rotundata, H. rupestris, Pupa umbilicata, Clausilia rugosa* and *var. dubia, C. laminata, Zua lubrica, Pisidium fontinale, Neritina fluviatilis, Limnaea peregra* and *Ancylus fluviatilis;* all the water shells were found in the River Yore. A very curious specimen of *Clausilia rugosa, var. dubia* was found by my brother, it has two mouths, one each way, and was alive when found; I sent it to Mr. Roebuck of Leeds for his inspection, and he made the following remarks: " it is a very fine example of the double-mouthed monstrosity, the two mouths being well formed'' In more favourable weather the above list might be greatly augmented, as the district seems a perfect one for shells.

The following is a list of the Lepidoptera noted: Ghost Swift *(Hepialus humuli).* Brimstone Moth *(Rumia crataegata).* Willow Beauty (*Boarmia rhomboidaria),* Silver-ground Carpet *(M.montanata).* Magpie *(Abraxas grossulariata).* Dark Marbled Carpet (*C*. *immanata),* and the Yellow Shell *(C. bilineata).*

EXCURSION TO AYTON, JULY 6. The following insects were observed: Small Heath *(C. pamphilus),* Painted Lady *(V. Cardui),* Common Blue (*Lycana icarus).* Gray Mountain Carpet *(Larentia caesiata), M. montanata, C. bilineata,* The Belle *(Eubolia palumbaria),* Chimney Sweeper (*Tanagra chaerphyllata).* Yellow Underwing (*Tryphaena pronuba),* and the Scarce Silver Y *(Plusia interrogationis),* the last-named being the most notable, as it is a moth of rather uncommon occurrence.

EXCURSION TO DINSDALE, JULY 13. In Lepidoptera the following species were noted: *S. janira, C. pamphilus.* Small Tortoiseshell *(Vanessa urticae), L. icarus,* Twin Spot Carpet (*Larentia didymata), A. grossulariata, M. montanata, C. pyraliata, C. bilineata,* Small Mallow (*Eubolia mensuraria).* Green Oak Moth (*Tortrix* v*iridana),* and *T. pronuba.*

The only species of Land Shells noted were: *Zonites alliarius, Helix aspersa, H. rotundata,* and *Clausilia laminata.*

BOTANICAL NOTES.

The following Plants have been noted in flower during the season.

A— Battersby to Kildale, 25 May, 1889. B —lngleby Greenhow, 22 June, 1889. C—Richmond, 8/10 June, 1889. D—Ayton, 6 July, 1889. E—Nunthorpe and Eston Moor, August 17, 1889. **F—** Dinsdale, 13 July, 1889.

Ranunculus repens		A	B	C	Genista tinctoria				B
Ficaria				A	Sarothemnus scoparius				A
acris		A	B	C	Trifolium pratense			A	C
bulbosus			A	C	procumbens	A	B	C	
Flammula			A	C	repens		B	C	
aquatilis			A	C	arvense				B
arvensis				B	minus		B	C	
hederaceus				B	Lotus corniculatus	A	B	C	
Caltha palustris ...			A	C	Anthyllis vulneraria		C	D	
Berberis vulgaris ...			B	C	Vicia sepium	A	B	C	
Chelidonium majus				D	cracca		B	C	
Cheiranthus Cheiri				C	sativa			C	
Nasturtium officinale			B	C	Lathyrus macrorrhizus		A	B	
Arabis hirsuta				C	pratensis		B	C	
Cardamine pratensis		A	B	C	Spiraea ulmaria			D	
amara		A			Poterium sanguisorba			C	
Sisymbrium thalianuni				C	Alchemilla vulgaris	A	B	C	
Alliaria officinalis				C	Potentilla tormentilla	A	B	C	
Brassica campestris				C	anserina		B	C	
Capsella Bursa-pastoris			B	C	reptans		B	D	
Reseda Luteola				C	Fragaria vesca	A	B	C	
lutea				B	Rubus fruticosus		B	C	
Helianthemum vulgare				C	Geum urbanum	A	B	C	
Viola canina				A	rivale		A	C	
tricolor				D	Rosa canina		B	C	
Drosera rotundifolia				D	Crataegus oxyacantha		A	C	
Polygala vulgaris			A	C	Pyrus aucuparia			A	
Silene inflata				C	malus			A	
Lychnis diurna		A	B	C	Epilobium palustre	B	E	F	
vespertina				A	tetragonum			B	
Flos-cuculi			B	C	parviflorum			F	
Alsine verna				C	montanum			C	
Stellaria Holostea...		A	B	C	Circaea luteiana			D	
media		A	B	C	Hippuris vulgaris			D	
graminea				B	Sedum acre			C	
Cerastium glomeratum	A	B	C	D	Ribes glossularia			A	
triviale				D	Saxifraga tridactylites			C	

Spergula arvensis			D
Malva rotundifolii...			C
sylvestris ...			C
Tilia Europaea			C
Hypericum pulchruin			D
perforatum			E
Geranium	A	B	C
robertianum			
pheum			C
molle			C
pratense			C
lucidum			C
columbinum			C
Oxalis Acetosella ...			A
Linum catharticum	B	C	D
Ulex europicus		A	C
Galium Aparme	A	B	C
verum			B
saxatile		B	C
Valeriana dioica ..			A
officinalis			B
Valerianella Auricula			D
Knautia arvensis			D
Scabiosa succisa			F
Petasites vulgaris			A
Eupatorium			F
cannabinum			
Bellis perennis	A	B	C
Achillea Millefolium	B	C	D
Matricaria inodora			B
Chrysanthemum			
Lencanthemum		B	C
Scenecio vulgaris	A	B	C
viscosus			E
Jacobaea			D
Arctium majus			D
Carduus			C
acanthoides			
Centaurea nigra			B
Cyanus			D
Leontodon hispidum			C
Tragopogon		A	C
pratensis			
Hieracium Pilosella		B	C
murorum			C
Taraxacum officinale	A	B	C
Sonchus oleraceus			A
...			

Chrysosplenium			A
alternifolium			
oppositifolium		A	C
Sanicula europaea	A	B	C
Carum flexuosum	A	B	C
Heracleum sphondylium		B	C
Scandix pectin-veneris			B
Chraeophyllum temulum			B
sylvestre			C
anthriscus			C
Myrrhis odorata			C
Sambucus ebulus			F
Lonicera periclymenum		B	D
Sherardia arvensis			C
Asperula odorata	A	C	D
Galium cruciatum	A	B	C
Nepeta Glechoma	A	B	C
Lannum purpureum	A	B	C
album			C
GaleopsisTetrahit...		D	E
Stachys sylvatica			B
Betonica		C	D
Ballota foetida			F
Ajuga reptans	A	B	C
Primula vulgaris			A
veris		A	C
Lysimachia Nummularia			A
nemorum	B	C	F
Anagallis arveiisis			D
Plantago lanceolata	A	B	C
media			C
major			C
Chenopodium Bonus-		A	C
Henricus			
album			B
Rumex Acetosa	A	B	C
Acetosella			B
obtusifolius			C
Polygonum Bistorta			C
Euphorbia exigua		D	F
Mercurialis perennis	A	B	C
Parietaria diffusa			C
Urtica dioica	A	B	C
Humulus Lupulus...			F
Salix			A

asper			C
arvensis			D
Campanula		C	D
rotundifolia .			
latifolia			D
Calluna vulgaris			D
Erica Tetralix			D
cinerea			D
Symphytum			D
oflicinale			
Echium vulgare			D
Myosotis sylvatica		A	C
arvensis	A	B	C
palustris			C
Verbascum Thapsus			C
Digitalis purpurea...		B	D
Linaria Cymbalaria			C
vulgaris			D
Scrophularia nodosa		B	C
Pedicularis palustris		A	D
Rhinanthus Crista-		B	C
galli .			
Euphrasia officinalis	B	C	D
Odontites rubra		D	E
Veronica	A	B	C
chamaedrys			
Beccabunga	A	B	C
serpyllifolia		A	B
agrestis		C	D
hederifolia			C
scutellata			D
Mentha viridis			F
aquatica			F
Salvia Verbenaca		C	D
Thymus Serpyllum		C	D
Prunella vulgaris			B

Orchis mascula			A
maculata	A	B	C
Habenaria viridis ...			A
Listera ovata			B
cordata			D
Alisma Plantago ...			D
Allium ursinum	A	B	C
Endymion nutans		A	C
Luzula campestris			A
sylvatica			C
Arum maculatum		A	C
Carex vulpina			F
stricta (?)			A
divuls			C
Anthoxanthum odoratum			C
Alopecurus pratensis		B	C
agrestis			C
Agrostis alba			C
Aira caespitosa			C
Avena pubescens ..			C
Poa annua			C
trivialis			C
Briza media		A	C
minor			C
Cynosurus cristatus			B
Dactylis glomerata			C
Bromus asper			C
Equisetum palustre			C
Polypodium vulgare			D
Asplenium Ruta-			C
muraria...			
Blechnum borcale...			D

NOTES ON THE CLEVELAND DYKE

BY

W. Y. VEITCH

President of the Cleveland Naturalists' Field Club.

The most interesting physiographical feature of this district is the Cleveland Whin dyke, and consequently it has attracted considerable attention. Having been carefully examined, several able papers have been written concerning it, and it is no doubt a well-worn subject. My aim will be to gather together scattered facts, and the results of the latest investigations relating to the dyke.

Whinstone is a word loosely used in many parts of England; the porphyrite of the Cheviots is spoken of as whinstone; the hard sandstone of the Lower Greensand of west Sussex is also so called, any hard sandstone seems to be known as white or grey whin. The term whin is here applied to an igneous rock, pertaining in character to a basalt, which has come up through the intermediate stratification in a molten state, forming a wall traversing the country from Maybecks on Sneaton high moor, near Whitby, and about four miles from the sea, to Armathwaite in Cumberland.

On petrological grounds Mr. Teall says the Armathwaite dyke is a continuation of the Cleveland dyke, it points to the north west direction where great volcanic eruptions took place in tertiary times, generally ascribed to the Miocene age. The earlier lava thrown out by those eruptions was acidic, and the composition of the dyke pertains more to acidic than basic, and is most probably the result of the western disturbances mentioned.

This wall breaks through the Oolite and Lias rocks at Maybecks, crosses the Murk Esk near Grosmont, is also seen at Ainthorpe, Castleton, Commondale, Kildale, Easby moor, Ryehill, Ayton, Nunthorpe, cutting through the rhoetics near Newby, and pierces the New red sandstone at Stainton, Preston, and at Coatham beck, near the village of Elton. Following it into Durham we find it nowhere in contact with the magnesian limestone. In the carboniferous rocks at Bolam, it is again found, but has deviated from the wall formation, and by lateral intrusion has formed a small whin sill, it may be traced through the carboniferous rocks to Cock field fell and onwards. Mr. Teall followed it up to Woodland fell, a point one mile east of Middleton. Mr. Howell, superintendent of the geological survey in Scotland, points out other exposures, one 11/2 miles N. E. of High Force where the dvke crosses Bowles beck. Another exposure is about one mile south of Tyne head. It is traced in the Eden valley, having passed through the Pennine range and entered again into secondary rocks where it becomes the Armathwaite dyke.

This intrusive rock is fairly straight in its course with occasional slight deviations; it varies in thickness from 20 to 80 feet. Here at Ayton, it is 80 feet

thick at the base of Roseberry, whilst at the highest part of the intrusion it is only 20 feet. In some places in its course it appears to die out, not having penetrated through the superincumbent stratification. To use Mr. Barrow's words “another interesting point is the unevenness of its upper surface, as it frequently disappears for a considerable distance, and then reappears. When first seen, in the western area it occurs in soft shales, and, in consequence, forms a strongly marked ridge, as is well seen about Langbaurgh and Cliff ridge. As far as the top of Cliff ridge the dyke reaches the surface, but does not appear on the east slope of the hill. The drift makes it doubtful whereabouts it again crops out, but there is a large quarry in it at Slack's wood. Just beyond this it must again sink beneath the surface, reappearing only at one point in Howl road. The calcined ironstone and several trial holes show that it has just failed to burst through the solid rock here."

This feature of the dyke is described as occurring in other parts of its course by the same observer. Mr. Teall also describes the same effect occurring in the coal measures at Cockfield, where "the whinstone was seen to terminate upwards very abruptly in the form of a low and somewhat irregular dome, over which the coal measure shales passed without any fracture and only with a slight upward arching·."

The effect upon rocks in contact has been comparatively slight; heat has calcined them for a few feet distant, and coal is completely coked. Lateral pressure has altered the cleavage of stratified rocks from horizontal to the vertical for a few inches.

Another curious point noted by Mr. Barrow is the way in which, for a few yards, the beds dip into the dyke. It looks as though the intrusive rock had contracted on cooling and dragged down the adjacent rock with it. In no case is the dyke known to be in a line of fault.

In structure the dyke is an exceedingly compact hard crystalline rock, grey or rather bluish grey in colour, weathering to a deep brown. Being a most excellent material for macadamizing, it is extensively quarried for that purpose.

The chemical composition as analysed by Mr. Stead, is as follows---

Silica	59.25
Alumina	16.75
Ferric oxide	4.00
Ferrous oxide	4.82
Lime	6.88
Magnesia	3.81
Potash	1.92
Soda	2.56

* Carbonic Acid a trace

This analysis and a lower specific gravity shows the rock to be acidic in character rather than basic or basaltic. The absence of olivine tends to remove it further from a true basalt. Mr. J. J. H. Teall describes it as an augitic andesite; for exhaustive information upon the minute structure of the rock, I commend you to that gentleman's work on British Petrography.

We have the interesting fact that the dyke breaks through the whin sill, becoming probably connected with the volcanic disturbance, which has left us the basalt, of the north of Ireland and the Hebrides. At the time we assume that this dyke was formed, the west and north of Scotland was part of a chain of volcanoes; the Isle of Mull is the fragment of one which, according to Professor Judd, probably had a diameter at its base of nearly 30 miles, and a height of from 10,000 to 12,000 feet. The highest point of what remains of this mountain does not attain more than 3,000 feet.

* from Teall on some of the North of England dykes.

From this centre of volcanic action a great number of dykes radiate, the one we are discussing even penetrating this district.

The Isle of Skye is also a ruined volcano, estimated by Professor Judd to have reached a height of from 12,000 to 15,000 feet, and must have been comparable to Etna or the peak of Tenerife.

Faroe Isles and Iceland are part of the same system of plutonic action, and were most probably all in activity concurrently. The period of this eruptive action will now be discussed.

Because aqueous rocks of the Carboniferous age, containing Lepidodendron and Calamites, have been detected in the Sound of Mull, near Ardtornish by Professor Judd, the volcanic rocks in that neighbourhood are said to be probably of carboniferous age; I have visited the Sound of Mull and examined the rocks about Ardtornish, and have found lias ammonites and *Gryphaea incurva,* and magnesian limestone covered over with vast sheets of lava. Close by at Loch Aline Cretaceous rocks are also so covered over.

In fact, all the sedimentary rocks up to and including the cretaceous have been burst through. The dyke here (Cleveland) has penetrated into the oolite. The rock is therefore post-cretaceous.

Text-books (*e.g.* Page) tell us that these mountains were thrown up in Miocene times, and this statement has generally been accepted.

However, Mr. J. Starkie Gardner, in his monograph published by the Palaeontographical Society, says "there is no physical evidence against these volcanoes belonging to any part of that vast period which intervened between the British white chalk and the British Eocenes, nor to any stage of the Eocenes; but they do present evidence of such antiquity that we ought to hesitate to assign them to any later period, unless very good reasons for doing so were apparent."

The plant evidence upon which they were classed as Miocene has always been of the weakest description; and had geologists who have written about them troubled to look into it independently, the conclusion as to their age would never have been accepted." P. 79.

Again " There is a total absence of evidence connecting them (plants) with Miocene. " P. 80.

According to Professor Phillips, Miocene strata are believed not to occur in the British Isles.

Such high mountains as the western range could not exist long without snow and rain forming channels and ultimately rivers coursing to the sea.

Water ways have been worn in course of time, lava and tufa have been pulverised by varying temperature and rain, the detritus having been carried down the mountain slopes, formed here and there rich soil upon which the flora of the period flourished, fragments of plants became embedded in mud and sand, were over-whelmed with lava, and thus was sealed up the only evidence of the era. Denudation has revealed those beds. The plant beds are situated at Ardtun, in Mull, and were examined and reported upon by the Duke of Argyle many years ago.

Mr. Gardner has lately examined the beds and secured many specimens, most of which have found their way to the British Museum, he brings his botanical knowledge to bear upon the plant remains, and places them on the same horizon as the middle Eocene beds at Bournmouth.

The plants determined from Ardtun are a fern and some conifers.

The fern is named *Onoclea Hebraidica.*

The conifers are *Cryptomeria sternbergii*, *Podocarpus Campbelli, Ginkgo adiantoides* and *Taxus Campbelli.*

So we have a flora stretching from subtropics to Greenland. The fern is identical with *O. sensibilis,* a well-known fern to those who indulge in ferneries, it was once found wild in a lane near Moreby, North Yorkshire, (Bains), and is naturalised at a spot near Warrington (Babington).

Mr. Gardner gives the range of the nearest existing representatives of the fossil conifers as follows:

C. Sternbergii, C. Japornca, China and Japan.
Ginkgo adiantoides, G. biloba do. do.
Taxus Campbelli, T. adpressa, do. do.
Podocarpus Campbelli, P. falcata, Cape.

From this flora, we might transfer our thoughts to Fusiama, and find in Japan a picture, which would probably show us something like the woodlands,

which clothed the slopes of our western volcanic mountains. The southern Eocene flora of England points more to Australian types, and it would appear that this first dawn (Eocene) of life advanced from north southward.

Turtles and Crocodiles *(Crocodiles Gamalis)* sported in the waters. Gigantic birds (G*astornis Parisiensis*) and albatross-like birds ran and flew about. Numerous quadrupeds, similar to our present fauna existed, together with herbivorous pachyderms and insectivorous bats, opossums and monkeys roamed the land, and it is probable that the *Archithierium,* a three-toed quadruped of pony size, supposed to be the ancestor of the horse, was also abroad.

During this period, north Europe was one continent. South Europe, north Africa, Asia minor, Alps, Carpathians, Caucasus and Himalayas, were not, their place was occupied by the sea and the nummulitic limestone which now enters largely into their structure was being deposited,

Since then many vast changes have taken place, we have become insular, our western mountain range has been shorn down to its present modest dimensions.

The mighty mountains and continents just enumerated have been uplifted. A stupendous revolution has been enacted which is scarcely comprehensible! Out of the nummulitic limestone thus raised, the Sphynx has been carved and Pyramids built. Even since then, empires have passed away, and languages have become dead! The valleys have been exalted and the mountains laid low!

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