TRANSACTIONS

OF THE

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At the Meeting of Ordinary Members held on Tuesday, December 6th, 1864, after the reading of Mr. Ward's paper, a very extensive and beautiful series of rock and mineral sections were exhibited by Mr. S. Allport, by means of a powerful microscope. The beauty and variety of the specimens excited general interest.

At the Monthly Meeting held on Tuesday, February 6th, 1865. Mr E. B. Martin, C.E., occupied the chair. Rev. J. H. Thompson, Cradley, delivered an address on the

"GEOLOGY OF THE TYROLESE ALPS,"

of which the following is an abstract:—

The Tyrolese mountains are in the eastern portion of the great chain of the Alps. From Northern Europe you can travel by rail as far as Innsbruck, the chief city in the Tyrol, which is a suitable place for head quarters, and has a good collection of minerals, rock specimens, geological maps, &c., at the museum.

The railway from Innsbruck to Botzen is in progress, and will probably be completed in a few years, and be the first across the high Alpine chain. At Botzen you again find the railway open southerly to Trent, Verona, &c. In the other parts of the Tyrol, you may travel along the main roads by coach or van, but many of the most interesting points must be reached on foot.

Among the sedimentary rocks to which my observations are chiefly confined, *Silurian*, *Devonian*, and *Carboniferous* are not prominent measures in the Eastern Alps, and are often metamorphosed—still more so as you follow the chain westerly, where palæozoic remains are wanting.

Permian is absent in the Tyrol and South of Europe.

Trias is well seen in Grödner Thal with characteristic Muschelkalk fossils; and at Recoaro, where it rests on mica schist and is capped with dolomite. (See the section of the Spitze of Recoaro.) It is not so clearly seen in North Tyrol, and seems wanting in the Western and Central Alps.*

Jurassic:—Our lias and oolite near the igneous district of South Tyrol and Venetia, is often changed into magnesian limestone (dolomite), and in the Western Alps into sulphate of lime, (gypsum), as in Aix thermal springs.†

Our Portland limestone though plentiful in the Jura, is wanting in the Alps.

Cretaceous.—The base is Neocomian, which is a thick and important part of the system. Above this is the scaglia, and still higher the Inoceramus. These represent our chalk.

Tertiary.—The lowest Alpine zone of this formation is nummulitic, probably middle eocene, though formerly classed as cretaceous.

Mountains north of Lake Wallenstadt, shew an instructive section giving the sequence of these rocks, and comprising Jurassic, Neocomian, Inoceramus, Nummulitic, and flysch.

Grünten Mountain, east of Immendstadt, 6,000 feet high teaches the succession of cretaceous and eocene. Its top being Upper Neocomian, which has a large horizon in the calcareous regions of the Alps, Mount Pilatus for instance.

Similar sequence of Cretaceous and Tertiary may be learnt east of Sette Communi, in Venetia. Above the scaglia is nummulitic, and above it, younger tertiaries highly inclined by upheaval.

I saw plenty of scaglia on headlands, between Recoaro and Vicenza. At Valdagno, it is overlaid by eocene coal seams with nummulitic above.

Monte Bolca too has nummulitic, containing lignite and tertiary shells.

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* The salt mines are chiefly near the point where Tyrol, Upper Austria, and Bavaria meet. I descended one at Hall, by an amusing kind of glissade. Water is introduced into the salt marl chambers, and the brine when strong enough is pumped up, and often carried in pipes, many miles over hill and dale to the forests, which supply fuel for the evaporating houses, coal being little known in this country.

† The Dolomitic Region is in the South Eastern part of the Tyrol, and the adjacent parts of Venetia. It is difficult of access, and almost unknown to travellers. But since the recent publication of Gilbert and Churchill's "Dolomite Mountains," English tourists will no doubt be attracted by the wonderful scenery produced by their stupendous precipices and fantastic peaks. Those who wish to go fully into the geology of this peculiar district must study the graphical descriptions, map and coloured sections in the quarto volume, published in 1860, by Baron von Richthofen. I have also been much indebted to Murchison's learned and masterly illustration of the Geology of the Alps in the Quarterly Journal of the Geological Society, vol. 5., part I.

Also eocene fishes and plenty of igneous rocks around, which may have helped to boil and broil the shoals of fish.

I spent an interesting day among the columnar basalt in this district, which is beautiful and plentiful.

Ronca and Montecchio Maggiore, are noted for fossils.

Magra, west of Schio, has scaglia and basaltic tuff in alternate beds, with nummulitic and eruptive rocks above.

This Vicentine district has become complicated by eruptions and dislocations which have disturbed the regular sequence, and even reversed the strata north of St. Orso, near Schio.

Nummulitic overlies cretaceous at Kalisberg mountain above Trent; and at Sardagna, west of Trent, nummulitic overlies inoceramus as at Mount Grunten. These rocks occur also 7,000 feet high at Monte Bordone, south west of Trent.

Younger Tertiary.—Above the flysch (middle eocene), is a great break, above which are nagel-flue and molasse often highly inclined and dislocated. The masses of nagel-flue at the Rigi and Speer (north of Wesen), may be 6,000 or 8,000 feet thick.

Higher in the series may come the deposits of Solenhofen and Œningin, east of Basle famous for fossil fishes and insects.

There are remarkable gravel terraces on the road between Innsbruck and Sterzing, 500 feet above the present river, which Lyell calls to his aid in determining the Antiquity of Man.

DISLOCATION IN THE ALPS.

The Sedimentary rocks ranged in the direction of great granitoid crystalline ellipsoidal nuclei, often overlaid with schistose or slate rocks, *e.g.* that from Meran to Brunecken, and also of the minor ellipsoids at Recoaro and other tracts in Tyrol as well as Lombardy and Switzerland.

The culminating peaks are generally found in the nucleus or the schist. Powerful action has taken place along their major axes of the ellipsoids. The Swiss and Savoy Alps have been much agitated, and the region south west of Mont Blanc immensely dislocated. The strata from the eocene downwards have been undulated, contorted, fractured, and even inverted. Tremendous faults occur, letting down younger rocks so as to be in contact with the oldest, and apparently to pass under them, at the Grünten for instance, or at Haslach, near Dorbirn, where a person would suppose that the nummulitic rocks passed under the neocomian. Sedimentary rocks often fold round the ends of the ellipsoids. Some of these circumstances are connected with crystalline changes, others are referable to mechanical agency. There must have been enormous overthrows and gigantic inversions exceeding in grandeur our highest imaginations. The upraising of the highest mountains in Europe is shewn to be a comparatively recent event.

Younger tertiaries have been tremendously moved, and upheaved into highly inclined and apparently inverted positions. But geological agencies are mighty. Intense heat—immense pressure—volcanic fury—great earthquakes—eruptions—contortions—upheavals—fractures—overthrows—enormous dislocations—extensive ancient glaciers,—metamorphic action. Such powers as these exerted on a grand scale are sufficient to account for all the wonderful geological phenomena, which are presented to our view either in the Tyrolese Alps, or any other region in the world.

The following Paper was also communicated by Dr. Fraser, M.A., Wolverhampton, entitled

"PLANTS FOUND IN STAFFORDSHIRE, 1864."

It has been deemed advisable to publish in these Transactions, some account of the plants which grow spontaneously in this part of the country. To insure success in such an undertaking, the co-operation of many individuals, carried on for a series of years will be absolutely necessary. And yet the Society includes among its Members, Ladies and Gentlemen connected more or less directly with the counties surrounding Dudley, who, by their united exertions could furnish in due time, a good account of the Botanical productions of Worcestershire, Warwickshire, Shropshire, and Staffordshire. Indeed lists of plants of these counties, more or less full, have been published many years ago. But in consequence of the changes which are continually taking place, many of these are now no longer to be found in their old habitats. It is therefore desirable to examine anew these localities as well as others which may not hitherto have been explored, and to give as fair a view as possible of the state of the existing Flora.

The following list is furnished as a first instalment of Wild Plants collected during the last year in the county of Stafford. It makes no pretension to anything like a full and complete catalogue, as there are hundreds of other plants to be found in the county. It only indicates the number actually observed by one individual during the last Summer. Indeed only a small portion of the county could be visited, and this not on any regular plan, but as time and circumstances permitted. It is given with the view of making a beginning, and of stimulating others to enter upon similar fields of investigation. The results of their labours will be published from time to time, and in this way it is to be hoped, that by the labours of many, some approximation towards a correct account of the Botanical productions of this part of the country at the present time, may be arrived at.

Great advantage would be obtained by mapping out a county into different well defined portions, examining these in succession, and furnishing lists of the plants found in each. This, however, implies a more intimate acquaintance with the numerous districts than we at present possess. But

the same zeal, energy and perseverance which have been displayed in other parts of the country will achieve this result also for our own.

Among the most interesting localities which we have visited during the last summer, may be mentioned the *Wren's Nest* and Neighbourhood including Sedgley. Here we have gathered Hypericum dubium, Lithospermum officinale, Cynoglossum officinale, Atropa Belladonna, Campanula Trachelium, Galeopsis Ladanum, Cnicus Eriophorus, and *Lower Penn* about the Canal and Pirton Reservoir where Butomus umbellatus, Oenanthe Phellandrium, Typha, latifolia and angustifolia, Colchicum antumnale, Campanula patula, Cornus sanguinea, Hippuris vulgaris, Myriophyllum spicatum, Epilobium angustifolium, Carex vesicaria, ampullacea, &c., may be gathered.

Kingston Pool, near Stafford, and Stafford Castle are both excellent localities; and so also is the neighbourhood of Norton Bog and Reservoir. But by far the most interesting of all is the district of the Carboniferous or Mountain Limestone in the North East of the county, a district rich in natural scenery but comparatively unknown to the inhabitants of South Staffordshire. It is about forty square miles in extent, and includes the Valleys of the Hamp and the Manyfold with its two channels above and below ground, and half of the Valley of the Dove. Many plants are confined to this district and only to be found there in the county. Among others we may mention the beautiful little Hutchinsia petræa, one of the earliest of the Vernal Flora. Pyrus Aria, Arabis hirsuta, Viola hirta, Cardamine impatiens, Poterium sanguisorba, Vicia sylvatica, Silene nutans, Plantago media, Polemonium coeruleum, Helianthemum vulgare; as well as as Viola lutea, Orchis pyramidalis, Gymnadenia conopsea, Habenaria chlorantha, Saxifraga hypnoides, Chrysosplenium alternifolium, Campanula latifolia, Parnassia palustris, Allium vineale, Cystopteris fragilis, Ceterach officinarum, and many others, all of which were found, and most of them plentifully during last summer.

RANUNCULACEÆ.

Clematis Vitalba, Compton, Holloway Hedge.

Thalictrum flavum, Meadows at Wightwick, Compton, Trescott, &c.

Anemone nemorosa, Baggeridge Wood, and others Woods. common.

Ranunculus aquatilis, The Pools, common.

Ranunculus fluitans, In the Dove, on the Staffordshire side.

—— hederaceus, In shallow ponds, frequent.

—— Ficaria, hedge banks, &c., common.

—— Flammula, woods, sides of ditches, &c., common.

—— Lingua, Kingston Pool, near Stafford.

—— auricomus, Baggeridge Wood, hedges about Penn Common, and at Ilam, &c.

Ranunculus acris, meadows, common.

Ranunculus repens, common in meadows and waste places.
—— bulbosus, common in meadows and pastures.
—— hirsutus, Tettenhall Wood, Pirton, in pastures.
—— sceleratus, marshy places, frequent.
—— parviflorus, field near the Dippens, Wrottesley.
—— arvensis, corn fields, &c., Langley, &c.
Caltha palustris, marshy places, common.

BERBERACEÆ.

Berberis vulgaris, Dingle, Trysull.

NYMPHÆACEÆ.

Nymphœa alba, Aqualate, North side in a stream.
Nuphar lutea, Aqualate, Dymingsdale Pool, &c.

PAPAVERACEÆ.

Papaver argemone, fields in light soils, Trysull, &c., plentiful.
—— dubium, Wightwick, Lower Penn, Trysull, &c.
—— Rhœas, Fields, Wightwich, Lower Penn, Trysull, &c., common.
Chelidonium majus, Lower Penn, Trescott, &c.

FUMARIACEÆ.

Corydalis claviculata, Craddock Moss, plentiful.
Fumaria officinalis, common in fields, &c.

CRUCIFERÆ.

Thlaspi arvense, Fields at Trysull, frequent.
Capsella Bursa pastoris, everywhere.
Hutchinsia petræa, a beautiful little plant, plentiful on Limestone's Rocks, at the entrance of Dovedale, Staffordshire.
Teesdalia nudicaulis, Sandy Places about Kinver.
Lepidium Smithii, Canal Bank, Lower Penn, near Baggeridge Wood, &c.
—— campestre, Trysull, frequent.
Armoracia rusticana, Railway Bank, near Wolverhampton.
Draba verna, Hedge Banks, common.
Camelina sativa, Field at Orton, near Wombourne.
Alyssum calycinum, clover field at Langley, Lower Penn.
Cardamine pratensis, wet fields, frequent.
—— hirsuta, sides of ditches, waste places, frequent.
—— impatiens, Valley of the Manyfold, Ilam, and on limestone.
Arabis thaliana, hedge banks, frequent.
—— hirsuta, Manyfold Valley, Dovedale, Staffordshire, and Wetton Valley, Ecton, on limestone.
Turritis glabra, hedge bank in lane, near Pattingham.
Barbarea vulgaris, Sedgley, Tettenhall, &c.
Nasturtium officinale, common in wet marshy spots.
—— terrestre, banks of pool at Dymingsdale, near Sedgley, &c.

Nasturtium amphibium, at Pirton Pool.
Sisymbrium officinale, Waysides, common.
Erysimum cheiranthoides, Railway Bank, near Wolverhampton, Trysull.
—— Alliaria, hedge banks, common.
Sinapis arvensis, corn fields too common.
—— alba, Field by Barnhurst, by side of Small Brook.
Raphanus Rhaphanistrum, Cannock, Clent Hills, &c.

RESEDACEÆ.

Reseda luteola, plentiful on coal pit banks in the South, &c.
—— lutea, between the Wren's Nest and Tipton.

CISTACEÆ.

Helianthemum vulgare, Valleys of Manyfold and Dove.

VIOLACEÆ.

Viola palustris, Norton Bog.
—— odorata, Tettenhall, Wergs, Oaken, Trescott, Trysull, Penn, and both white and purple.
—— hirta, near Beeston Tor, Manyfold Valley on limestone.
—— canina, common everywhere.
—— tricolor, common everywhere.
—— lutea, High Pastures between Leek and Warslow.

DROSERACEÆ.

Drosera rotundifolia, Norton Bog, Craddock's Moss.

POLYGALACEÆ.

Polygala vulgaris, Sedgley Old Quarry, &c., common.

CARYOPHYLLACEÆ.

Silene inflata, waysides frequent, Wightwich, &c.
—— nutans, Alstonefield, Dovedale, and on limestone.
Lychnis Flos-cuculi, common in meadows.
—— diurna, common.
—— vespertina, common.
—— Githago, corn fields, frequent.
Sagina procumbens, common.
Spergula arvensis, field, common.
Spergularia rubra, Norton Bog Bank, Tettenhall Wood, &c.
Arenaria serpyllifolia, common.
—— trinervis, Orton, Merridale, &c., frequent in woods, hedges, &c.
Stellaria media, everywhere.
—— Holostea, hedge banks, common.
—— glauca, Compton, Wightwick meadows.
—— graminea, frequent.
—— uliginosa, frequent.
Malachium aquaticum, Coven, Compton, Kingston Pool, frequent.

Cerastium vulgatum, common.

—— viscosum, common

LINACEÆ.

Linum catharticum, Sedgley old quarries, Ecton, &c., pastures, frequent.

MALVACEÆ.

Malva moschata, Bilbrooke, near Wolverhampton.

—— sylvestris, hedge banks, &c., frequent.

HYPERICACEÆ.

Hypericum perforatum. Wren's Nest, &c.

—— dubium, Wren's Nest.

—— quadrangulum, Compton meadow, Trysull, Kingston, &c.

—— humifusum, Compton, Pennfields, &c., in light soil.

—— pulchrum, near Wrottesley, frequent on heaths.

—— hirsutum, Marston, Stafford Castle, Rocester, &c.

ACERACEÆ.

Acer campestre, common in woods and hedges.

—— pseudo-platanus, common in woods and hedges.

GERANIACEÆ.

Erodium cicutarium, Wightwick mill road side, Bratsh, Trysull, &c.

Geranium pratense, Tutbury.

—— molle, common.

—— dissectum, frequent in fields.

—— columbinum, Trysull in sandy lanes, Dovedale, Manyfold, &c.

—— lucidum, valley of the Dove, Manyfold, &c., frequent.

—— Robertianum, common.

OXALIDACEÆ.

Oxalis acetosella, common in woods, &c.

CELASTRACEÆ.

Euonymus Europæus, Agualate, north side in hedge.

RHAMNACEÆ.

Rhamnus catharticus, near the Bratsh, in a hedge, between Wombourne and Trysull.

Rhamnus Frangula, Craddock's moss.

LEGUMINOSÆ.

Sarothamnus scoparius, lanes, &c., frequent.

Ulex Europæus, common.

Ononis arvensis, near Walsall, Penn, &c.

Anthyllis vulneraria, Dovedale, valley of Manyfold, &c., on limestone.

Medicago lupulina, frequent in fields, Tettenhall, Stafford, Walsall, &c.

Melilotus officinalis, fields about Stafford Castle.

Trifolium repens, common.

Trifolium pratense, common.
—— medium, Wren's Nest, &c., frequent.
—— arvensis, Cannock Station, Wichnor, &c., frequent.
—— procumbens, frequent in fields, &c.
—— filiforme, common.
Lotus corniculatus, common.
—— major, frequent in moist places.
Astragalus glyciphyllos, Aqualate both sides.
Ornithopus perpusillus, lanes about Orton, Kinver, &c.
Vicia sylvatica, Wetton valley, plentiful and very beautiful.
—— cracca, hedges, common.
—— sativa, waysides, frequent.
—— sepium, hedges, common.
—— hirsuta, common in fields, &c.
—— tetrasperma, Pirton, in hedges, not frequent.
Lathyrus pratensis, common.
Orobus tuberosus, Trysull, and frequent.

ROSACEÆ.

Prunus spinosa, common in hedges, &c.
Prunus Padus, Pendeford.
Geum urbanum, frequent, Wombourne, Trysull.
—— rivale, Baggeridge Wood, Penn, Dovedale, Stafford, &c.
Agrimonia Eupatorium, fine specimens near Pirton Pool, Tutbury, &c.
Potentilla anserina, common
—— reptans, frequent in hedge banks, &c.
—— tormentilla, heaths, &c.
—— Fragariastrum, common.
Comarum palustre, Norton bog, Trysull, &c., frequent.
Fragaria vesca, abundant.
Rubus Idæus, frequent
—— fruticosus, abundant.
Rosa tomentosa, Ecton hill.
—— canina, common in hedges.
—— arvensis, frequent,
Sanguisorba officinalis, Railway bank near Wolverhampton, Walsall, &c.
Poterium sanguisorba, Manyfold valley, Dovedale, Staffordshire.
Alchemilla vulgaris, common.
—— arvensis, common.
Cratægus oxycantha, hedges.
Pyrus malus, frequent, Lower Penn, &c.
—— Aria, Dovedale
—— aucuparia, Woods.

ONAGRACEÆ.

Epilobium angustifolium, Trysull, Codsall.
—— hirsutum, ditches, &c., Trysull.
—— parviflorum, Kingston Pool.
—— montanum, frequent.
—— palustre, ditches, Kingston Pool.
—— tetragonum, ditches, &c., frequent.
Circæa Lutetiana, Ilam, Baggeridge Wood.

HALORAGIACEÆ.

Hippuris vulgaris, Pirton, Canal reservoir.
Myriophyllum verticillatum, Kingston Pool.
—— spicatum, Pirton Pool.
Callitriche verna, pools, ditches, &c.

LYTHRACEÆ.

Lythrum Salicaria, Coven pool, Pendeford, Kingston.

CUCURBITACEÆ.

Byronia diocia, hedges, frequent.

SCLERANTHACEÆ.

Scleranthus annuus, Sandy fields, plentiful.

GROSSULARIACEÆ.

Ribes rubrum, brook at Trysull.
—— Grossularia, Baggeridge Wood.

CRASSULACEÆ.

Sedum acre, Cannock.
—— reflexum, Tettenhall.
Sempervivum tectorum, roofs of outhouses, &c.

SAXIFRAGACEÆ.

Saxifraga granulata, sandy lanes Trysull, &c.
—— tridactylites, Kinver, Manyfold valley, &c.
—— hypnoides, Ecton Hill.
Chrysosplenium oppositifolium, frequent in damp spots.
—— alternifolium, Manyfold valley.
Parnassia palustris, Ecton.

ARALIACEÆ.

Adoxa moschatellina, hedge banks.
Hedera Helix, frequent.

CORNACEÆ.

Cornus sanguinea, Trysull dingle, lane at Trysull.

UMBELLIFERÆ.

Hydrocotyle vulgaris, Norton bog, &c.
Sanicula Europæa, woods.

Conium maculatum, Kingston pool, Tutbury Castle, plentiful.
Petroselinum sativum, Sedgley old quarry.
Helosciadium nodiflorum, brook at Wightwick, Lower Penn.
Ægopodium Podagraria, Lower Penn, &c.
Bunium flexuosum, woods.
Pimpinella saxifraga, Walsall, Hayhead, &c.
—— magna, Stafford Castle, Hayhead, &c.
Sium angustifolium, Lower Penn canal.
Oenanthe fistulosa, Lower Penn marsh, &c.
—— Phellandrium, Pirton pool, plentiful.
Æthusa Cynapium, frequent.
Silaus pratensis, Hayhead, &c.
Angelica sylvestris, woods, &c.
Pastinaca sativa, Sedgley old quarry.
Heracleum Sphondyllium, common.
Daucus Carota, common on banks, &c.
Torilis anthriscus, hedges.
—— infesta, fields Pirton, Stafford.
—— nodosa, field between Trysull and the Bratch.
Scandix Pecten, Lower Penn.
Anthriscus vulgaris, Bamhurst, Tettenhall, Kinver, &c.
—— sylvestris, hedges.
Myrrhis, odorata, Manyfold valley.

CAPRIFOLIACEÆ.

Sambucus nigra, Wightwick, frequent.
—— Ebulus, Tutbury Castle.
Viburnum Opulus, Trysull, hedges, &c.
Lonicera Periclymenum. hedges.
—— Xylosteum, Trysull dingle.

RUBIACEÆ.

Galium verum, common.
—— cruciatum, common.
—— palustre, common.
—— uliginosum, Compton.
—— saxatile, heaths, &c.
—— Mollugo, Wombourne.
—— Aparine, hedges.
Sherardia arvensis, hedges.
Asperula odorata, woods, Rocester, &c.

VALERIANACEÆ.

Valeriana dioica, meadows, frequent.
—— officinalis, frequent.

Fedia olitoria, common.

DIPSACEÆ.

Dipsacus sylvestris, Tutbury Castle.

—— pilosus, Stafford Castle.

Scabiosa succisa, Lower Penn meadows.

—— columbaria, Manyfold valley, Dovedale, &c.

Knautia arvensis, sides of fields, hedges, frequent.

COMPOSITÆ.

Tragopogon pratensis, Sedgley old quarry, &c.

Picris hieracioides, Sedgley old quarry, Tutbury.

Apargia hispida, wood sides, frequent.

—— autumnalis, common

Hypochœris radicata, common.

Lactuca muralis, Baggeridge Wood, Tutbury, Hayhead.

Sonchus asper, frequent.

—— arvensis, common.

—— oleraceus, common.

Crepis virens, common.

Hieracium pilosella, common.

—— umbellatum, hedge bank, at Nurton, near Pattingham.

—— boreale, Railway banks, Wolverhampton, Bilston, &c.

Taraxacum officinale, everywhere.

Lapsana communis, frequent.

Arctium Lappa, Wren's Nest, &c., frequent.

Serratula tinctoria, Ecton hill.

Carduus nutans, in fields, frequent, Trysull.

—— lanceolatus, common.

—— Eriophorus, Wren's Nest, Sedgley, Hayhead.

—— palustris, everywhere.

—— arvensis, abundant.

—— pratensis, Agualate, North side in meadows.

—— heterophyllus, Ecton hill.

Carlina vulgaris, Wren's Nest, Hayhead, Manyfold valley.

Centaurea nigra, common.

Centaurea scabiosa, Nurton, Pattingham.

Bidens cernua, Pool, near Wolverhampton.

—— tripartita, Pirton Pool.

Eupatorium cannabinum, ditches, &c., frequent.

Tanacetum vulgare, Lower Penn.

Artemisia Absinthium, Sedgley old quarry, near Kinver.

—— vulgaris, common.

Gnaphalium sylvaticum, Kinver.

Gnaphalium uliginosum, abundant in damp places.
Filago germanica, pastures, Trysull, &c.
Petasites vulgaris, meadows, Compton, Sedgley.
Tussilago Farfara, common.
Erigeron acris, Tutbury Castle.
Solidago virgaurea, Warslow, Alton.
Senecio vulgaris, everywhere.
—— sylvaticus, Cannock, &c.
—— Jacobæa, too common.
—— aquatica, Stafford, Aqualate.
Inula Conyza, Baggeridge Wood.
Pulicaria dysenterica, Lower Penn.
Chrysanthemum segetum, near Newton Road.
—— leucanthemum, Trysull, Lower Penn, &c.
Pyrethrum Parthenium, Hurst Hill, Stafford.
Matricaria chamomilla, fields.
Anthemis Cotula, fields, common.
Achillea Ptarmica, Walsall, Wednesbury.
—— Millefolium, common.

CAMPANULACEÆ.

Campanula rotundifolia, common.
—— patula, Wooded Bank, near Trysull.
—— latifolia, Stafford Castle. Ilam.
—— Trachelium, Hurst Hill, Sedgley.
Jasione montana, Canal Side, near Newton.

ERICACEÆ.

Erica tetralix, heaths, Cannock, &c.
—— cinerea, heaths, Cannock, &c.
Calluna vulgaris, heaths, Cannock, &c.
Andromeda polifolia, Craddock's Moss.
Vaccinium Myrtillus, Cannock Heath, Norton, Kinver, &c.
—— uliginosum, Norton bog.
—— oxycoccos, Norton bog.

ILICACEÆ.

Ilex aquifolium, hedges, woods, &c.

JASMINACEÆ.

Ligustrum vulgare, Tutbury.
Fraxinus excelsior, common.

APOCYNACEÆ.

Vinca minor, road side between Tettenhall and Codsall.
—— major, Brook Bank, Kinver.

GENTIANACEÆ.

Gentiana amarella, Sedgley.
Erythræa Centaurium, Trysull, Wombourne, frequent.
Chlora perfoliata, Hayhead.
Polemonium cæruleum, Ecton Hill.

CONVOLVULACEÆ.

Convolvulus arvensis, Tenn, Tipton, Tettenhall.
—— sepium, Penn, Tettenhall.

SOLANACEÆ.

Solanum Dulcamara, hedges, frequent.
Atropa Belladonna, Sedgley old quarry.

SCROPHULARIACEÆ.

Verbascum Thapsus, Trysull, Manyfold Valley, &c.
Veronica arvensis, fields.
—— serpyllifolia, common.
—— Anagallis, Tettenhall, Wimbourne, &c.
—— Beccabunga, common.
—— officinalis, frequent, hedge banks, woods, &c.
—— montana, frequent, Baggeridge Wood.
—— Chamædrys, hedge banks.
—— hederifolia, common.
—— agrestis, common.
—— Buxbaumii, Trysull, in cultivated field.
Bartsia Odontites, frequent, Lower Penn, Sedgley.
Euphrasia officinalis, Sedgley, Warslow.
Rhinanthus Crista-galli, abundant in meadows.
Melampyrum pratense, woods, Arley.
Pedicularis palustris, wet fields, &c.
—— sylvatica, woods.
Scrophularia nodosa, common.
—— aquatica, frequent, Tettenhall, &c.
Digitalis purpurea, common except on limestone.
Linaria vulgaris, hedges, frequent.

OROBANCHACEÆ.

Lathræa squamaria, Manyfold valley.

LABIATÆ.

Lycopus Europæus, Lower Penn, Ford Houses, &c.
Mentha aquatica, common.
—— arvensis, common.
Thymus Serpyllum, frequent.
Origanum vulgare, Tutbury, Manyfold valley, Dovedale.

Calamintha Acinos, Manyfold valley, Dovedale.
—— Clinopodium, Wren's Nest.
Teucrium scorodonia, woods, common.
Ajuga reptans, common.
Ballota nigra, waste places, frequent.
Galeobdolon luteum, woods frequent.
Lamium album, common.
—— amplexicaule, Tettenhall, Kinver.
—— purpureum, common.
Stachys sylvatica, frequent, Trysull.
—— palustris, common.
Betonica officinalis, frequent, Trysull.
Galeopsis Ladanum, Sedgley old quarry, and fields adjoining.
—— tetrahit, Kingston Pool.
Nepeta Glechoma, common.
Prunella vulgaris, common.
Scutellaria galericulata, Trysull, Kingston Pool, &c.

BORAGINACEÆ.

Myosotis palustris, common.
—— cæspitosa, Trysull, &c., frequent.
—— sylvatica, Manyfold valley, Yarlet.
—— arvensis, common.
—— Collina, sandy lanes, Trysull, Kinver.
—— versicolor, common.
Lithospermum officinale, Wren's Nest, Tutbury.
Symphytum officinale, Trescott, Baggeridge Wood.
Lycopsis arvensis, corn fields, Orton, Wrottesley, &c.
Cynoglossum officinale, Wren's Nest, Aqualate.
Echium vulgare, Trescott, &c.

PRIMULACEÆ.

Primula vulgaris, common.
—— veris.
Lyscimachia Nummularia, Kingston pool, near Walsall.
—— nemorum, woods.
Anagallis arvensis, fields and waysides.
Samolus Valerandi, Aqualate mere, south side.

PLATAGINACEÆ.

Plantago major, common.
—— media, Hayhead, Manyfold valley, &c.
—— lanceolata, common.

CHENOPODIACEÆ.

Chenopodium album, common.
—— Bonus-Henricus, Wightwick, Pirton, Tutbury.

Atriplex hastata, frequent in waste places.
—— patula, common.

POLYGONACEÆ.

Polygonum Bistorta, Wightwich and Compton meadows.
—— amphibium, Pirton pool, ditches, &c.
—— Persicaria, common.
—— Hydropiper, common.
—— aviculare, common.
—— convolvulus, frequent.
Rumex Hydrolapathum, Kingston, Stafford.
—— crispus, common.
—— obtusifolius, too common.
—— maritimus, Snowdon pool, Patsull.
—— Acetosa, common.
—— Acetosella, common.

EMPETRACEÆ.

Empetrum nigrum, frequent, Norton Resorvoir, Craddock's Moss.

EUPHORBIACEÆ.

Euphorbia helioscopia, common.
—— exigua, Hayhead, Penn, &c.
—— Peplus, frequent.
—— amygdaloides, Wyre forest.
Mercuralis perennis, common.

URTICACEÆ.

Urtica urens, Wombourne, Penn.
—— dioica, common.
Parietaria officinalis, Tutbury Castle.
Humulus Lupulus, Lower Penn, Pirton, &c.

AMENTIFEREÆ.

Quercus Robur, woods.
Fagus sylvatica, common.
Corylus Avellana, woods, hedges, &c.
Alnus glutinosa, by brooks.
Betula alba, frequent.
Salix alba, Coven.
—— triandra, Pendeford.
—— viminalis, Tettenhall, Pendeford, Trysull.
—— cinerea, common.
—— caprea, common.
Myrica Gale, Aqualate.

ORCHIDACEÆ.

Listera ovata, frequent, Sedgley, Penn, Manyfold.

Epipactis latifolia, Stafford Castle, Somerford.
Orchis Morio, near Coldridge Wood, &c.
—— mascula, common.
—— pyramidalis, Manyfold Valley.
—— latifolia, Compton, Kingston pool.
—— maculata, common.
Gymnadenia conopsea, Ecton hill, plentiful.
Habenaria chlorantha, Manyfold valley.

IRIDACEÆ.

Iris Pseudacorus, frequent.
Crocus nudiflorus, pasture at Wolstanton.

AMARYLLIDACEÆ.

Narcissus Pseudo narcissus, meadow at Moseley Old Hall.
Galanthus nivalis, Oaken meadow.

LILIACEÆ.

Fritillaria meleagris, Wheaton Aston.
Allium vineale, Manyfold valley.
—— ursinum, Manyfold valley.
Hyacinthus nonscriptus, woods.

TRILLIACEÆ.

Paris quadrifolia, Baggeridge wood, and with five leaves.

MELANTHIACEÆ.

Colchicum autumnale, Lower Penn.

ALISMACEÆ.

Alisma Plantago, common in pools.
Butomus umbellatus, Lower Penn, Pirton pool.
Triglochin palustre, Aqualate.

FLUVIALIS.

Potamogeton perfoliatus, Lower Penn, Trescott.
—— natans, common.

ARACEÆ.

Lemna minor, common.
Arum maculatum, common.
Sparganium simplex, frequent.
—— ramosum, frequent.
Typha latifolia, Lower Penn, Kingston pool.
—— augustifolia, Lower Penn, Kingston.

JUNCACEÆ.

Juncus glomeratus, common.
—— glaucus, Lower Penn.
—— effusus, common.
—— acutiflorus, frequent.

Juncus lamprocarpus, frequent.
—— bufonius, common.
—— squarrosus, heaths, Norton Bog.
Luzula sylvatica, woods, Biddulph.
—— pilosa, woods, frequent.
—— campestris, common.
Narthecium ossifragum, between Leek and Warslove.

CYPERACEÆ.

Schœnus nigricans, Norton Bog.
Rhyncospora alba, Craddock's Moss.
Scripus lacustris, Pirton, pool, Kingston pool.
—— sylvaticus, Trysull, Lower Penn.
——cæspitosus, heaths, Norton, &c.
Carex pulicaris, Aqualate.
—— stellulata, Trysull, Norton, &c.
—— ovalis, frequent.
— curta, Norton Bog.
—— muricata, frequent, Lower Penn.
—— vulpina, Pirton pool, Lower Penn.
—— paniculata, frequent, Lower Penn.
—— vulgaris, frequent.
—— acuta, Norton Bog.
—— panicea, Baggeridge Wood, &c.
—— sylvatica, Baggeridge Wood.
—— Pseudo-cyperus, Wombourne, Field House, &c.
—— glauca, Baggeridge Wood.
—— pilulifera, Norton, plentiful.
—— hirta, frequent.
—— ampullacea, Lower Penn Canal.
—— vesicaria, Lower Penn Canal.
—— paludosa, Pendeford, &c.
—— riparia, Wightwich, &c., frequent.

GRAMINEÆ.

Phalaris arundinacea, Lower Penn.
—— canariensis, near Wolverhampton.
Anthoxanthum odoratum, common.
Phleum pratense, common.
Alopecurus pratensis, common.
—— geniculatus common.
—— agrestis, near Stafford.
Milium effsum, frequent, Picton, Yarlet.
Agrostis vulgaris, common.

Agrostis alba, Kingston Pool.
Arundo Phragmites, Small Pool, Picton.
Calamagrostis lanceolata, Aqualate.
Aira cæspitosa, frequent, woods.
—— flexuosa, common heaths, Norton, &c.
—— caryophyllea, frequent in sandy places.
—— præcox, Kinver, &c.
Avena pubescens, Manyfold valley.
—— flavescens, frequent.
Arrhenatherum avanaceum, common.
Holcus lanatus, common.
—— mollis, common.
Molinia cærulea, heaths.
Poa aquatica, Lower Penn, &c., frequent.
— fluitans, common.
— pratensis, common.
— trivialis, common.
Briza, media, common.
Cynosurus cristatus, common.
Dactylis glomerata, common.
Festuca ovina, frequent.
—— duriuscula, frequent, Sedgley.
Bromus asper, frequent.
—— giganteus, Tutbury, &c.
—— sterilis, common.
—— mollis, common.
Brachypodium sylvaticum, common in lanes.
Triticum repens, common in hedges.
Lolium perenne, common.
Hordeum murinum, Tutbury.
Nardus stricta, heaths, Norton.

FILICES.

Ceterach officinarum, Beeston Tor, Manyfold valley.
Polypodium vulgare, common.
Cystopteris, fragilis, luxuriant specimens at Ecton Hill.
Polystichum aculeatum, Manyfold valley.
Lastrea Filix-mas, woods and hedges.
—— dilatata, frequent.
Athyrium Filix-fœmina, woods.
Asplenium Trichomanes, Manyfold valley.
—— Ruta-muraria, frequent.
Scolopendruim vulgare frequent.

Blechnum boreale, common.
Pteris aquilina, common.
Ophioglossum vulgatum, Sedgley, Marston.

EQUISETACEÆ.

Equisetum Telmateia, Penn, near Church.
—— arvense, common.
—— sylvaticum, common.
—— palustre, common.
—— limosum, common.

Votes of thanks to the Rev. J. H. Thompson and Dr. Fraser were unanimously passed.

On February 7th, a Committee Meeting was held. Present, Messrs. H. Johnson (chair), H. Burton, E. Hollier, F. T. Higgs, and the Secretary.

George Lewis, Coleorton, Ashby-de-la-Zouch, was elected a Field Member.

Arrangements were made for accepting the Warwickshire invitation to attend their Annual Meeting on the 14th February.

On Tuesday, February 14th, a Field Meeting was held at Warwick, on the invitation of the Warwickshire Naturalists' Club. The weather was so severe that only a few Members undertook the journey. The proceedings included two valuable papers, on the "Bone Caves of Liege," and on the "Lias Remnants in Staffordshire and Cumberland;" a visit to the famous Keuper quarries, near Warwick, which have yielded abundant Labrynthodon remains; and dinner in the evening.

A Meeting of the Committee was held on Tuesday, March 7th. Present, Messrs. Jas. Solly (chair), H. Johnson, S. Bailey, S. Allport, T. Brettell, W. Madeley, E. J. Renaud, E. Hollier, C. Ketley, and the Secretary.

The following were elected Members.—*Honorary:* Walter Williams, jun., Hon. Sec. South Staffordshire Ironmasters' Association; W. P. Marshall, Sec., Institute of Mechanical Engineers.—*Ordinary:* W. G. Woodcock, Eagle Coal and Iron Company, Westbromwich; W. H. Ford, Goldthorn Hill, Wolverhampton.—*Field Club:* John Williams, Mine Agent, The Lye.

The arrangements for the Summer Field Meetings were considered, and the following were adopted.

April 25th.—Hednesford.
May 16th.—Cradley.
June 20th.—Oxford.
July 18th and 19th.—Ludlow.
August 15th.—Stratford-on-Avon, (to meet Warwickshire Club.)

It was also resolved to hold Four Half-day Meetings of a popular character

at Rowley, Wren's Nest, Pouk Hill, and Sedgley, and that Non-Members be admitted to these Meetings at a small fee.

A letter was received from the Committee of the Mechanics' Institution, stating that they had appointed a deputation to wait upon the Geological Society, relative to the matter in dispute, and it was resolved to hold a Special Committee Meeting on March 21st for the purpose of receiving the representatives of the Institution.

At the Ordinary Meeting for April a Paper was read by Mr. Henry Johnson, entitled,

SUGGESTIONS AS TO THE MEANS OF EXTENDING THE SOUTH STAFFORDSHIRE COAL FIELD.

It will no doubt be in the recollection of the Members present that in March, 1863, I read before this Society a Paper on "*The Practical application of Geology to the Industrial Pursuits of the South Staffordshire Mineral District.*"

In that Paper I called the attention of the Members to the great necessity and importance of—if possible—extending this Coal-field, and more particularly to the probable continuity of the Thick Coal from Cradley towards Bromsgrove, underneath the Permian, and to the probable existence of Coal at moderate depths underneath the Lower New Red Sandstone and Permians over the vast districts lying between the South Staffordshire and Shropshire Coal-fields, and the South Staffordshire and Warwickshire Coal-fields. It will, no doubt, be gratifying to the "working" Members of this Society to know that since the Reading of that Paper no less than six very important purchases of Mines have been made, and five *sinkings* commenced in the South end of the Coal-field, by the spirited firms of *Messrs. King and Co.*, Cradley Park; *Swindell and Co.*, Homer Hill; *Geo. Pell and Co.*, Wassel Grove; *New British Iron Co.*, Hawne; and *J. S. Dawes*, Manor Farm, Halesowen. All these sinkings are, I believe, going on most satisfactorily. *Messrs. King and Co.* after having passed through 70 or 80 yards of purple marls, have reached the Thick Coal at about 170 yards.

Probably the two most important sinkings are those of Messrs. Pell and Co. and Mr. J. S. Dawes, lying about three miles apart, and extending nearly two miles over the originally explored boundary of the Coal-field. In the event of the Thick Coal being discovered in these two sinkings—which there appears at present no doubt about—at least 4,000 acres may be safely calculated upon as proved by these two trials.

Seeing the spirit of enterprise which emulates capitalists in the South end of the Coal-field, we may reasonably leave them for a time and let them

go on sinking, whilst we turn our attention to the development of the two unexplored vast districts lying between the South Staffordshire and Shropshire Coal-field, and between the South Staffordshire and Warwickshire Coal-field, (see plan appended.) To assume by fair geological reasoning the existence of Coal under these extensive tracts of New Red and Permian, is probably far more easy than to provide means to absolutely prove its existence or non-existence. But the province of this Paper is to endeavour to point out a practical, economical, and certain mode of deciding the question once and for ever.

If then we take the district lying between Staffordshire and Shropshire first, we shall have, from Lilleshall to Rugeley, a distance of 20 miles, and from Madeley to Kingswinford, about 14 miles, and from a distance a little North of Wheaton Aston to Areley Wood and Bewdley Forest, 21 miles or a total area of **357 square miles, or 228,000 acres.**

This vast tract is bounded on the East by the South Staffordshire Western boundary fault, running North and South, which is a downthrow West, and brings in the Permians with the Coal Measures dipping underneath all along its course, for 20 miles, and over which fault no proof has yet been made. Several attempts have however been made to do so, by driving "level away" out of the Thick Coal workings on the rise side, across such fault, only however to find the existence of the Permian, and a large influx of water, and necessitating an immediate and strong damming off.

On the Shropshire side, this tract is bounded by an Eastern boundary fault, running nearly North and South, which is a downthrow East, but I believe a very interesting proof has lately been made of the existence of mines on the downthrow side of this fault, underneath the Permian, about half-way between Shiffnal and Oakengates. On the whole, the Geological conditions of the Shropshire side are quite analogous to the South Staffordshire side, the Permians resting unconformably upon the denuded edges of the Coal Measures of the two Coal-fields.

The centre of this great tract of unexplored country would be at *Patshull*, but a spot more favourable for conducting the proof may be selected near to the Great Western Railway, at Albrighton. Proximity to an existing Railway or Canal should be regarded on account of the transit of heavy materials, and as a market for the produce, should any be discovered.

What I have to suggest then, to be carried out at this or some other more favourable spot, is the putting down of a *single shaft*, 12 or 14 feet in diameter, to a depth, if necessary, of say from 600 to 700 yards,* which could

* Monkwearmouth Colliery, Sunderland, sunk in 1826, is about 600 yards deep, has been worked ever since, and likely to last another century. It passed through the New Red, Magnesian Limestone, and Permians.

The Dunkenfield Colliery, near Ashton-under-Lyme, exceeds 700 yards in depth, and was sunk about three years ago. This also passed through the New Red and Permian.

be as readily done now as one of 100 yards in depth could have been done 50 years ago. The cost of this single shaft, with all suitable winding and pumping machinery, if carried out with perseverance and economy, would not, I think, exceed **£40,000.** But the very natural question is asked "Where is the money to come from."? My answer to that is this, if the *Landowners* of the district referred to, would subscribe **7/6** per acre upon **114,000** acres, that being only *one half* of the total area of **228,000,** it would more than cover the £40,000 required.

In asking for subscriptions upon only a moiety of the total area, it would allow to leave all the small Landowners out of the question, and so confine the matter to large Landowners alone; and I think if such a project was properly launched, under good auspices, that not only could the money be readily raised, but a successful proof made in three years at the farthest. I speak with hope and confidence from the fact that some such a project has been adopted, at my suggestion, in the South end of the Coal-field, only upon a smaller scale, and is answering every expectation, and to which I shall have hereafter to refer at greater length. I would suggest the selection of some large Landowner's property, (having regard at the same time to the economical transit of materials and produce) as the site of the intended exploration, and, before commencing operations, such owner should covenant to return to the subscribers all the subscribed capital in the event of either the Shropshire Measures or the South Staffordshire Measures being discovered, and not to allow him the use of the Pit or Machinery until it was repaid. He would, in that case, sink the second shaft at his own cost. If success attended the proof, all the original subscribers would get their money returned, and in the event of its proving a failure, and even the total loss of the £40,000, it would scarcely be felt individually. The whole business may be managed by Trustees of local Landowners, a Committee with a sprinkling of Coal and Iron Masters amongst their number, and an efficient staff of practical and energetic officers.

It may be asked, would the *one shaft*, in some such a position as the one suggested, prove the whole district referred to? I have no hesitation in saying, for all practical purposes, it would, and if either the Shropshire or the South Staffordshire Mines were discovered, at that point, I believe, in a few years, that the whole district would become studded by similar explorations.

It may be observed, by some parties, why commence operations so far from either of the known Coal-fields? And why commence at a point where the New Red and Permian are supposed to be thickest? My answer to that would be,—in order to satisfy and deal fairly with all the subscribers, the situation should be as central as possible, and if the trial shaft was sunk at a point where the Permian was thinnest, it may be regarded as no proof at all

of that portion where the New Red and Permian existed, and would be certain to produce dissatisfaction amongst some of the subscribers. In suggesting the sites for the proposed trial sinkings, both on the Shropshire and Warwickshire side, I have been guided by the fact that the "greater includes the lesser," and that the extra cost of an additional 100 or 150 yards of sinking is more than counterbalanced by the site being more central, more comprehensive, and possessing better Railway facilities.

Let us suppose for a moment that such proof should terminate successfully, and that either the Shropshire or the South Staffordshire measures were discovered, what would be the commercial advantages to the Country? Suppose *only* the Brooch Coal, Thick Coal, Heathen Coal, and Gubbin Ironstone and White Ironstone to be found. The aggregate *sales* of the produce of these mines, in this area, at a low estimate, and after making considerable deductions for Towns, Villages, and other properties, under which the mines could not be worked, would probably amount, prospectively, to the enormous sum of £2,000,000,000 sterling!!— (two thousand millions sterling); and the Landowners would, out of this, be fairly entitled to upwards of £100,000,000 sterling as Royalty!! You no doubt think these are pretty figures to deal with, and so would even the Chancellor of the Exchequer, but if we could, by any means, see a correct account of the total sale proceeds of all the Mines ever raised in old South Staffordshire, I think we should all be equally surprised at the figures.

It should be borne in mind that the New District under discussion is more than *four* times the area of all the South Staffordshire Coal-field put together, the former being 228,000 acres, whilst South Staffordshire proper, is only about 51,000 acres.

In making these suggestions for the proof on so comprehensive a scale, of the two large Tracts of Country before referred to, I am quite prepared for them to be *pooh, poohed!!* by men who have given the subject but little attention, or who know more about "green fields" than they do about Coal pits, but I well recollect the time when the *Cannock Chase Coal* was pooh, poohed; and the *Ulverstone Hematite*, lying on the Millstone Grit; the *Northamptonshire Iron Ore*, lying in the Lias; the *North Wales Cannel Coal;* the *Froghall Ironstone*, lying on the Millstone Grit; *The Wiltshire Iron Ore;* and last, but not least, the great *North Yorkshire Iron Ore District*, in the Oolite, were all in their turn pooh, poohed!!—All more or less condemned at one stage of their existence, but they have all outlived the condemnation. *Bessemer's* process was also pooh, poohed! but some of his revilers would now be very glad of his Royalties.

As regards the North Yorkshire district, it is perhaps needless for me to add one word—it is well known that the development of this Iron making district, in less than 20 years, is unexampled in the annals of mining

throughtout the world, situate as it is upon the Oolite, and so far removed from Coal, that necessary adjunct to iron-making, a district that if a person 30 years ago had predicted that the barren Cleveland Hills and country round would ever become what it has in 1865, he would have been set down as a madman. In 20 years, 87 Blast Furnaces, and numerous Foundries, Mills, and Forges, have been erected and are working most prosperously, and a further number of 27 Blast Furnaces are in course of erection.*

We have only to be made acquainted with the astounding commercial returns of the new districts referred to, to become convinced how necessary it is to give unexplored districts a trial before condemning them.

Let us compare then the enormous advantage of £2,000,000,000 sterling, with the insignificant outlay of £40,000, or even £50,000 to decide such a question, and one is only struck with astonishment that some such a project has never yet been carried out.

That some such a scheme as the one suggested can be carried out successfully is fully borne out by the fact, that it is now being done on a small scale by Mr. J. S. Dawes, at the Manor Farm, Hales Owen. After I read my last Paper on this subject, Mr. Dawes wrote to the public press concurring in my views, that Coal would be found in the Hales Owen district, and suggested a "Limited Liability Company" to carry out the proof. I shortly afterwards informed him privately of the "suggestions," the subject of this Paper, he acted upon them, and in a few months he obtained the co-operation of nearly all the *Landowners* in the district, in which he is now sinking, to the extent of £1 *per acre*, and is thereby enabled to prosecute an expensive and difficult search with comparatively little risk to himself. He, of course, has covenanted to return the subscriptions (without interest) in the event of the trial proving a successful one. I consider the Landowners in the neighbourhood of Hales Owen will owe Mr. Dawes a debt of gratitude for the spirited manner in which he has come forward with his own capital, and for the trouble and anxiety he will experience in developing, not only his own mines, but those of the Hales Owen district generally.

It is true that objections may be raised by some of the "Lords of the soil," and "great Country Squires" of the Shropshire and Warwickshire district before referred to, to have their quiet territory invaded by Pits, Engines, and all the paraphernalia belonging to a Mining district, but they would have the lively reflection that they would be made, at least, twenty times the richer by

* "The large works of Messrs. Bolckow and Vaughan, the pioneers of the Iron Trade of the district, are to be transferred to a Limited Liability Company at the commencement of 1865. The price is to be £2,500,000. Messrs. Bolckow and Vaughan have been in the trade some 12 years. Theirs was the first Foundry started on the Tees, and they were the first to work the Oolite Ore of Cleveland with profit. They have both amassed colossal fortunes, although both commenced life in very humble spheres. Mr. Bolckow is a German, and Mr. Vaughan is a Welshman." Ryland's Iron Trade Circular, Dec. 24, 1864.

the change, and I never knew a person yet who ever objected to his circumstances being improved to that extent.

Having called your attention to what I suggest should be done with the tract of New Red and Permian lying between Staffordshire and Shropshire, I will next refer to that lying between the Staffordshire and Warwickshire Coal-fields. This district is bounded on the West by the Eastern boundary fault of the South Staffordshire Coal-field, running from Brereton to Hales Owen, which is a down-throw East, with the Coal dipping underneath the Permian the latter lying unconformably on the denuded edges of the Coal measures. The Eastern side of this Permian tract is bounded principally by the workings of the various Warwickshire Collieries, from Coventry to Tamworth, and many of such Collieries are now raising Coal from underneath the Permian as their only source of supply.

The length of this Permian district may be taken from a little North of Lichfield, to a little South of Birmingham, in length about 20 miles, and in width, from Rugeley to Tamworth, 13 miles, and from Hales Owen to Coventry, 24 miles. This would give us a total area of about **230,000** acres, a little in excess of the Shropshire district previously described. The centre of this tract would be about Sutton Coldfield, but perhaps a more convenient spot for sinking a trial shaft may be selected between the Fazeley and Birmingham Canal, and the Birmingham and Derby Railway, near Castle Bromwich. As the Geological conditions of this district are precisely analogous to the one lying between Staffordshire and Shropshire, (except the great probability of the red rocks being thinner than those of Shropshire, and consequently less depth to the Coal) my former remarks, as regards the cost of the suggested trial sinking—and the enormous prospective advantages to be derived, apply about the same in this case as that. It would be no mean adjunct however to have a customer like Birmingham situate in the midst of it, with its 300,000 coal consuming inhabitants; and I have no doubt there would be quite as much mining enterprise to be found in the Warwickshire as in the Shropshire Landowners, in furthering the scheme suggested. There is this too, which is perhaps worth mentioning as affecting the Warwickshire district favourably, by showing the probable *undulatory surface of the Coal Measures underneath the Permians;* which fortuitous circumstance may go far to remove the idea some people entertain of the necessarily great depth of the Coal Measures below the Permians. By looking at the Ordnance Map you will perceive a patch of Coal Measures, about a quarter of a mile square, lifted to the surface at Arley, near Over-Whitacre. Surrounded by Permians, the Coal Measures here dip away underneath the former, and but for these Coal Measures just peeping out, uncovered as they are by the Permian, their depth may reasonably have been set down at from 200 to 300 or even 500 feet. Many more instances of

isolated patches of Coal Measures exposed at surface, in large areas of Permian, may be mentioned, but as the undulatory character of the Coal Measures must be admitted, where they are exposed in large areas at surface, I think their undulatory surface must also be admitted where they are covered by Permian and New Red, and, in this case, the great depths to the Coal, through the latter beds, as estimated by some authors, may, I think, yet turn out erroneous in practice.

I have refrained, as much as possible, from entering into any lengthened arguments as to the existence of Coal under the New Red and Permian, as that is now a generally accepted conclusion. Hundreds of Collieries at the present moment are raising Coal from under the New Red and Permian* and I see Mr. Hull† goes so far as to predict the ultimate connection of all the Coal-fields, underneath the New Red Sandstone throughout central England, from Newcastle-on-Tyne to Worcester, a distance of 160 miles. Reasoning then by analogy it is not much to predict a probable connection of the Coal Measures being established between Staffordshire and Shropshire, and between Staffordshire and Warwickshire, an average distance of about 18 miles only.

I cannot, however, conclude my remarks without some reference to a very able and interesting Paper read before this Society, by Mr. Hull, in July, 1863, wherein he observes:—

"The importance of this formation, from its position in reference to the Coal measures cannot be overlooked. Lying in an unconformable or discordant position upon the Permian and Carboniferous groups, it is sometimes in immediate contact with the Coal measures; and at others separated by several hundred feet. The question therefore of the depth to the Coal in certain localities, is one, which will often call for all the skill and knowledge of the most accomplished Geologist. Where the outcrop of these formations is concealed by faults (as is frequently the case on both sides of the South Staffordshire Coal field,) the question must often be decided upon the general principles of their distribution over considerable areas of country. The advance of Coal mining, and the rapid exhaustion of our Coal-fields in several localities, has already had the effect of causing the New Red Sandstone and Permian beds to be pierced in search of the precious mineral. Ever since the genius of the William Smith led him to infer the extension of the Yorkshire and Durham Coal-fields under the Magnesian Limestone of those Counties, Collieries have steadily multiplied over the region occupied by these formations; and from a calculation which I made not long since, they are probably not

* Messrs. Woodhouse and Jeffcock, the eminent Mining Engineers of Derby, have kindly sent me particulars of numerous successful sinkings which they have conducted through the Red Rock and Permians in different parts of the Kingdom.

† Quarterly Journal of Science for January, 1865.—"The History of the British Coal Measures," by Edwd. Hull, B.A., F.G.S., &c. p. 19, Vol. 5.

less than fifteen thousand millions of tons,—at depths less than four thousand feet beneath them. In South Lancashire several Collieries are sunk through Trias and Permian beds. You have similiar instances in your own immediate neighbourhood, as well as in Shropshire, Leicestershire and Warwickshire: but the most remarkable instance, perhaps in Britain, is that of the Somersetshire Coal-field,—of which, more than two thirds of its area are concealed by Triassic beds. For while the entire area of the Coal-field is 150 square miles, only 45 square miles present "exposed Coal measures."

The general distribution of the Trias and of the Lower Mesozoic formations generally, in England, has formed a subject of interesting investigation with me for several years; and appears to resolve itself into the general principle or law of "South-easterly attenuation." In other words, —we find these formations attaining their greatest vertical development towards the North West: and from thence thinning away toward the South-east. All the sub-divisions (including the Red Marl,) are subject to this principle; and in consequence, we find the formation attaining its greatest thickness in Lancashire and Cheshire,—and its least thickness in Warwickshire, where last seen before its ultimate disappearance beneath the Lias. Bearing this principle in mind, we can generally arrive at an approximate estimate of the thickness of the whole,—or any portion of the Triassic group;—by observing the position of the locality, with reference to Cheshire, on the one hand, and Warwickshire on the other. In a word, the "Line of maximum attenuation," stretches from the mouth of the Mersey, on the North-west to the mouth of the Thames to the South-east.*"

As confirmatory of the New Principle laid down by Mr. Hull, as to "South Easterly attenuation" of the New Red Series, it is a fact perhaps worthy of notice, that the same principle may be observed in the Coal Measures of this Coal-field. The Coals and Ironstones are always thicker at the outcrop (Bilston), than in the deep (Westbromwich), and the intermediate strata is also always thicker at the outcrop than in the deep.

South Easterly attenuation of the Coal Measures in the Warwickshire Coal-field, is more apparent even than that of South Staffordshire. At the Hawksbury Colliery, on the South East, nearly all the Thin Coals of the Warwickshire Coal-field are brought into a space of about 50 feet, while on the North West, near Fazeley, the same Coals lie in a thickness of from 500 to 600 feet of strata. At Hawksbury Colliery the section of the Coal is

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* "On the South Easterly attenuation of the Lower Secondary formation." Jour. Geol. Soc. Lond. Vol. 16, by Edwd. Hull, B.A., F.G.S., &c.

"On the New Red Sandstone and their relation to the Water Supply of the County." Do.

	ft.	in.
Two Yard Coal	6	0
Bare Coal	2	0
Ryder Coal	4	6
Ell Coal	5	7
Slate Coal	6	7
Lady Coal	3	0
Total thickness of Coal	27	8
Ditto of Partings	5	4
	33	0

This 27ft. 8in. of Clear Coal lies in a space of 33 feet, having only 5ft. 4in. of spoil intermixed with it.

With these remarks I must now leave the subject, and hopefully trust that at the close of the forthcoming Summer Field Club Excursions many additional new facts bearing upon the subject which I have now so imperfectly laid before you, will be collected by the Members of this Society, and that in the Autumn a full discussion, at the Society's Rooms, of so important a subject may ultimately lead to steps being taken to develop the New Districts referred to. In which case the Dudley and Midland Geological Society will not have failed to make itself, not only interesting, but useful and promising.

REPORT FOR 1864—5.

PRESENTED AT ANNUAL MEETING,

HELD AT DUDLEY, JUNE 6TH., 1865.

AT the close of the last financial year, the rules of the Society were considerably modified, and two classes of membership were instituted. These changes naturally led to some unsettlement amongst the members; but during the past year the society has been gradually adapting itself to the new organization, and it is satisfactory to state that the number of members on the list at the present time is nearly equal to what it was prior to the alterations alluded to. The actual position of the Society at the last Anniversary Meeting was somewhat as follows:—Ordinary Members, 54; Field Club Members, 61; leaving 300 names on the list from whom no returns had been received. There was also the sum of £27 15s. arrears of subscription from the two previous years, and a small balance due to the treasurer. Before, however, giving details of the present state of the Society, the Committee would offer a short abstract of the leading features in their operations during the year ending 30th April, 1865.

The Field Meetings have been on the whole of a highly satisfactory character, and have been so arranged as to include visits to interesting portions of the immediate locality.

In June a meeting was held at Cannock Chase, the route including the famous Norton Bog for the botanists, and the extensive collieries of the Cannock Chase and Hednesford Companies. The respective proprietors gave the members ample opportunities of inspecting the mines, and upwards of 50 members were present.

The July meeting was held at Llangollen in connection with the Manchester and Liverpool Geological Societies, and extended over two days. Thirty members were in attendance. The Llangollen Botanical Society kindly made arrangements for the botanists, but there were so few present that this part of the programme could not be carried out.

In August the Society received a visit from the Warwickshire Naturalists' Club, and had the pleasure of going over the geological haunts near Dudley, in company with the leading members of that Society, who before leaving invited the Dudley Club to attend their Annual Meeting in the following February. The Field Meeting for the month was held at Cheltenham, and was to have been a joint meeting with the Cotteswold Club; but owing to unforeseen difficulties in the railway arrangements, the day had to be changed, and thus the Society was deprived of the pleasure of again fraternising with the accomplished naturalists of that well known Society. Notwithstanding this a very pleasant day was spent, and upwards of twenty members attended.

In September a meeting was held at Hagley and Halesowen, Lord Lyttelton, Mr. W. Matthews and others, kindly affording every facility to the members. The weather was unfavourable, but upwards of twenty members were present.

In October the last meeting of the season was held at Friar's Park and Great Barr; but the attendance was meagre, only fifteen being present.

In February last the members were invited to meet the Warwickshire Club, but owing to the inclemency of the weather only very few attended. A joint meeting is, however, arranged for August next at Stratford, when it is hoped this Society will be well represented.

In April a meeting was held at Hednesford and the neighbourhood for the purpose of examining more fully that locality. Nearly sixty members attended, and the proceedings of the day were of a most gratifying character. Mr. F. Piggott, Mr. E. C. Peake and others received the Society and explained the details of the mining operations now in progress.

In August last the adjourned meeting for the discussion of Mr. Rupert Kettle's paper on the yield of the Ten Yard Coal, was held at Dudley, when a paper was read by Mr. Henry Johnson, and after a lengthy discussion a Committee was formed to undertake certain experimental enquiries, with a

view to determine a few points upon which some difference of opinion existed. These experiments are now in progress and will shortly be reported on by the Committee.

The monthly meetings of ordinary members commenced in September, and though many subjects of considerable interest have been discussed, the attendance has not been so numerous as could have been wished. The Committee trust that during another season these meetings, which are calculated to advance the objects of the Society in a marked degree, will be more generally recognised by the members. Full reports of the proceedings at these meetings are contained in Transactions of the Society, which have been issued (to ordinary members) at intervals of about three months. Last summer it was decided to publish a monthly journal under the auspices of the society, but the results were not satisfactory and the experiment was discontinued after the issue of three members.

A deputation from the Society (consisting of the Rev. J. H. Thompson and the Secretary) attended at the Bath Meeting of the British Association for the Advancement of Science, for the purpose of supporting an application for the Association to visit Birmingham in 1865. The Committee are glad to find that the invitation then given was accepted, and they trust that the members will render every assistance in promoting the success of the approaching meeting. The noble President of this Society has, with his customary liberality, invited the members of the Association to the Castle Hill Caverns and the adjoining Thick Coal Open Works.

The Committee regret that a dispute has existed during the greater part of the year, between the Society and the Mechanics' Institution relative to the interpretation of the agreements which had been mutually executed by the two Societies. As however the details of the whole matter have been printed and circulated, it is only necessary to state that the dispute has been satisfactorily terminated a short time ago, by the present Committee of the Institution reverting to the original agreement, which provides that the Museum shall extend to the front of the building. This arrangement has now been carried out, and the fossils and other specimens are being labelled, classified, and catalogued, the funds for this purpose being furnished (to the extent of £10) by the Museum Trustees. The same Trustees have also expressed their willingness to vote the necessary means for completing the fitting up of the recently added portion of the room, in uniformity with what has already been done.

The Committee have had the pleasure of receiving in July last, the sum of Ten Guineas, a bequest from the late Beriah Botfield, Esq., M.P., who will long be remembered as a liberal patron of the Arts and Sciences. This sum they have not expended; but they would recommend that it be appropriated to the purchase of books for the Library. They have also to

acknowledge the receipt of the following donations, for which they desire to express their best thanks :—

Transactions of the Royal Society.
" Cotteswold Naturalists' Club.
" Dumfries Naturalists' Club.
" Berwickshire "
" Warwickshire "
" Manchester "
" Manchester Geological Society.
" Liverpool "
" London Geologists' Association.

Papers from Mr. E. W. Binney and Mr. Edward Hull; Rev. W. Symonds, Lyell's Elements of Geology (new edition), Old Bones, Old Stones, by Mr. Symonds.

Collection of Rock Specimens from Italy. Mr. C. B. Mander.
" Cornish Minerals by Mr. F. A. Homer.
" Fossils from Greensand, Mr. Jas. Solly.
" Fossils from Canada, Mr. P. Beckett.

In accordance with Rule 15, Messrs. Henry Beckett, R. Kettle, E. F. Smith, and George Taylor, have been elected Trustees of the Society.

During the year the following periodicals have been taken in, viz.:—

Geological Magazine.
Mining and Smelting Magazine.
Intellectual Observer.
Popular Science Review.
Journal of Science.
Geological Journal.
Transactions of North of England Institute of Mining Engineers.

These have been bound up, and together with other works which have come into the possession of the Committee, form the nucleus of the Society's Library which they hope will be extended very considerably during the coming year.

The Exhibition Committee presented their Report and Accounts in November, shewing that the undertaking had resulted in a loss of £6 14s. 10d., which sum the Society has paid, together with sundry items included in the General Account. The loss is ascribed to the expense of getting together the articles, and to the short time the Exhibition was open.

The following is a statement of the number of Members during the year.

Honorary	29
Life	6

Ordinary	115
Field Club	196
Total	346

At the close of the year Five Ordinary and Thirteen Field Club Members resigned; but owing to subsequent elections the numbers of Members at the present time is

Honorary	29
Life	6
Ordinary	125
Field Club	224
Total	384

The Financial Statement shews total receipts £177 9s. 6d. and expenditure £161 3s., leaving a balance of £16 6s. 6d. in the hands of the Treasurer. The 115 ordinary Members represent an income of £118 13s. of which £108 19s. 6d. has been received leaving arrears £9 13s. 6d. The 196 Field Club Members represent an income of £49. Of this number, however, one is honorary, five subscriptions were inadvertently placed in last year's account, two have changed to Ordinary Members, and two have left the district without paying their subscriptions, so that the available income in this department is only £46 10s. of which £43 5s. has been received. Of the £27 15s. arrears, £14 15s. has been received, while, though the remainder has been repeatedly applied for, no notice has been taken of the Society's communications. The Committee cannot help expressing their surprise that those who have for two years enjoyed all the privileges of membership, and who were elected members according to their own proposals, should thus deprive the Society of the funds which are properly due to it, and should by these means do an act of injustice to those who have paid the claims to which all members are liable.

In conclusion the Committee are glad to be able to report that the modifications in the Rules, to which allusion has before been made, have operated so beneficially to the Society. They would remind the Members, however, that an Institution of this kind is naturally of slow growth; but they hope the increased means at the disposal of their successors will enable them to still further develop the Society and to extend its usefulness. They have endeavoured to do this during the past year, and have had the gratification of succeeding far beyond their expectations. They regard the present position of the Society with satisfaction, because as the charm of novelty has now worn off, the Institution has to stand upon its actual merits, and must succeed in proportion to the good work which it can accomplish. On all sides there are indications that scientific investigation has received in this district a

remarkable impetus during the last two years, and it is perhaps not too much to attribute this in some measure to the direct and indirect action of the Dudley Geological Society. The bearing of scientific research upon the important industries of this locality, upon the mining and metallurgical operations of the district, is also being freely acknowledged; and hence it may be hoped that the Society will have the hearty support of all who are interested in the commercial activity of this manufacturing centre, for assuredly an Institution of this kind is eminently calculated to develop not only intellectual, but material wealth. The Committee trust that the Dudley Geological Society is only yet in the infancy of a long life, and that year by year it may retain a leading position amongst the Institutions of the district.

Treasurer's Statement for Year ending 30th April, 1865.

Receipts.

	£	s.	d.	£	s.	d.
Arrears June 1862 and 1863 ...	27	15	0			
Less now owing	13	0	0			
				14	15	0
Subscriptions of 115 Ordinary Members	118	13	0			
Less now owing ...	9	13	6			
				108	19	6
Subscriptions of Field Club Members	46	10	0			
Less now owing ...	3	5	0			
				43	5	0
Executors of late B. Botfield, Esq., M.P. ...				10	10	0
				£177	9	6

W. MADELEY,
E. POOLE,
} Auditors.

Disbursements.

	£	s.	d.	£	s.	d.
Balance due to Treasurer				0	8	8
General Postage				12	4	2
Printing and Stationery				62	4	3
Advertising				7	5	6
Solicitors' Charges				0	10	3
Books, Binding and Periodicals				8	0	0
Field Meetings' Expenses:—	£	s.	d.			
Annual	0	9	6			
Cannock	2	7	0			
Llangollen	4	0	11			
Warwick	0	5	0			
Cheltenham	2	11	3			
Hagley	0	12	1			
Barr	1	16	6			
Warwick (winter)	2	0	6			
Hednesford	2	3	6			
				16	6	9
Deputations, Lectures and Reporters				7	12	0
Attending to Museum, &c.				4	10	10
Ordinary Meetings' Expenses				3	12	0½
Travelling Expenses				1	6	0
Secretary				20	0	0
Loss on Exhibition				6	14	10
Furniture, &c., for Ordinary Meetings				7	10	4
South Staffordshire Association				0	10	6
Sundries				2	6	10½
Balance in hands of Treasurer				16	6	6
				£177	9	6

The Meeting, when the above Report and Balance Sheet were presented, was held at the Society's Rooms, on June 6th, Mr. George Taylor, presiding.

The Reports and Accounts were laid before the meeting, and it was resolved that the same be printed and circulated amongst the Members.

The following modifications in the Rules were adopted:—

(1) That the words "Twenty-four" be substituted for "Twenty-one," in Rule 10.

(2) The latter clause of Rule 10 to stand:—"That voting papers be delivered personally by Members residing within two miles of the Society's Rooms, Wolverhampton Street, Dudley, but that those residing beyond that distance be allowed to send their voting papers by post to the secretary.

Resolved that the election of Vice-presidents be deferred until the Oxford Meeting on June 27th, and that a Special Meeting be held upon that day for the purpose of electing Vice-presidents for the ensuing year.

(N.B. At the meeting at Oxford, held June 27th, the following Vice-presidents were unanimously elected.

BLACKWELL, S. H. ESQ., F.G.S., Dudley.
BAKER, J. P. ESQ., F.G.S., Wolverhampton.
BECKETT, HENRY, ESQ., F.G.S., Wolverhampton.
CARTWRIGHT, CORNELIUS, ESQ., M.D., Dudley.
FLETCHER, CAPTAIN, M.A., F.R.S., F.G.S., Lawnswood.
GIBBONS, BENJAMIN, ESQ., Stourport.
KETTLE, RUPERT, ESQ., Wolverhampton.
MATHEWS, WILLIAM, ESQ., F.G.S., The Leasowes.
SMITH, FREDERICK, ESQ., M.A., Dudley.
SMITH, EDWARD FISHER, ESQ., Dudley.
TAYLOR, GEORGE, ESQ., Dudley.)

The Right Hon. the EARL OF DUDLEY was unanimously re-elected President; the Treasurer and Secretary were also re-elected.

The following Members were then elected on the Committee for the ensuing year:—

ALLPORT, SAMUEL, MR., Birmingham.
ASTON, JOHN, MR., Dudley.
BAILEY, SAMUEL, MR., Walsall.
BRETTELL, THOMAS, MR., Dudley.
BOWKLEY, SILAS, MR., F.G.S., Batman's Hill.
BURTON, HENRY, MR., Dudley.
CAPEWELL, L. P., MR., Dudley.
COOKSEY, JOSEPH, MR., F.G.S., Westbromwich.
COLLIS, W. B., MR. Stourbridge.
FEREDAY, S. D. MR., Dudley.
FELLOWS, J. U., MR., Walsall.

GRAY, CHARLES, MR., Bilston.
HAYWARD, W. H., MR., Oldbury.
HOLLIER, E., MR., Dudley.
HUNT, J. P., MR., Corngreaves.
JOHNSON, HENRY, MR., Dudley.
KETLEY, CHARLES, MR., Dudley.
MADELEY, WILLIAM, MR., Tiled House.
MARTEN, E. B., MR., C.E., Stourbridge.
McGHIE, THOMAS, MR., Cannock Chase.
SOLLY, JAMES, MR., Tipton.
STOKES, JOSEPH., MR., Dudley.
THOMSON, GEORGE, MR., Westbromwich.
THOMPSON, REV. J. H., Cradley.

It was resolved that the best thanks of the Meeting be given to the Committee and Officers for the past year.

A vote of thanks to the Chairman concluded the proceedings.

The following Paper was read by Mr. Samuel Allport, at the April Meeting of Ordinary Members, on

THE DISTRIBUTION OF ORGANIC REMAINS IN SOME OF THE UPPER SILURIAN ROCKS.

THE subject on which I intend to offer some remarks this evening is, as stated in the programme, "The Distribution of Organic Remains in some of the Upper Silurian Rocks."

To do this satisfactorily with reference to the entire series of Fossils, it would, of course, be necessary to draw up lists of the contents of each bed or sub-division, but as I have not at present anything like a complete table of the very numerous fossil forms which occur in these rocks, I shall call your attention only to the Trilobites.

I purpose now to discuss a portion of the contents of two beds, viz :— The *Wenlock* or Lower Shale, and the *Lower Ludlow* or Upper Shale, omitting the intervening bands of Wenlock Limestone. We shall thus have to deal with two strata of similar lithological character, both being deep-sea formations, and so far as we can judge deposited under similar circumstances. As they are everywhere found to be conformable with the Wenlock Limestone, and consequently with each other, they appear to form one continuous series, and in fact the Lower Ludlow is described by Murchison as "simply an upward prolongation of the Wenlock formation."

These rocks have been frequently described, and have for years attracted the attention of Geologists on account of the fine state of preservation of their fossil contents; several important collections have been made, and yet we are still without anything like a complete list of the Fossils of any one of the beds. There is no approximately correct list of the Fossils of the Wenlock

Shale, of the Wenlock Limestone, or of the Lower Ludlow Shale. It is true that such lists are to be found in the *Silurian System*, written nearly thirty years ago, but they are nearly worthless, and have in fact, been omitted in the subsequent editions of *Siluria*. In the latter work the Upper Silurian Fossils are all classed together as either Wenlock or Ludlow, the former comprising the Wenlock Shale and Limestone, and the latter the Lower and Upper Ludlow rocks. In the last edition of Morris's Catalogue we have simply Upper and Lower Silurian, without any other sub-division of the beds.

On referring to the tables given in the Silurian System it will be found that in the Wenlock Shale there are only *two* species of Trilobites, viz.: Phacops caudatus and P. longicaudatus, and in the Lower Ludlow *three* species, Homalonotus delphinocephalus, Calymene Blumenbachii, and Phacops caudatus. As the Homalonotus is wrongly placed in the Upper Shale, the list is reduced to *three* species only for both beds of Shale. Since this meagre list was published, the Wenlock Shale at Malvern, and the Lower Ludlow at Dudley have been explored, and have together yielded at least *thirty* species of Trilobites.

It is well known to Collectors in this district, that there is a considerable difference between the fossil contents of the Upper and Lower Shale, but the extent of that difference has not, so far as I am aware, been hitherto pointed out. My friend, Mr. Ketley, and myself have for some time past, directed our attention to the subject, and the comparison which we have been able to make between these beds, has led to interesting and rather unlooked for results.

In my own collection I have thirty species and well marked varieties from these two beds, and to these must be added three species in other collections, making a total of *thirty-three* species and varieties. The list from the Wenlock Shale is as follows:—Calymene Blumenbachii, and var. tuberculosa, Encrinurus punctata, Acidaspis coronatus, Sphærexochus mirus, Proetus N. Sp. allied to elegantulus, Ph. Grindrodianus, Cyphaspis elegantula, Phacops Downingiæ var. macrops, Ph. constrictus, Ph. Musheni, Ph. longicaudatus, and var. Grindrodianus, Lichas scuticauda, Illænus Barriensis Cheirurus bimucronatus, var. centralis, Staurocephalus Murchisonii, Deiphon Forbesii :— in all eighteen species.

From the Lower Strata we have Calymene Blumenbachii, Encrinurus variolaris, a variety with head-spines, Acidaspis coronatus, Acid. crenatus Acid. N. Sp. Proetus latifrons, Cyphaspis megalops, Phacops Downingiæ Ph. constrictus Ph. Stokesii, Ph. caudatus, and variety tuberculato-caudatus, Lichas Anglicus, Lichas hirsutus, Cheirurus bimucronatus:—in all sixteen species.

On comparing these lists it will be found that *four* species only are common to both, viz. :—Cal. Blumenbachii, Acidaspis coronatus, Phacops caudatus, and Phacops constrictus.

The great difference thus shewn to exist between the species of Trilobites found in these two beds of shale is certainly an important fact, and when supported by additional evidence, will, I think, indicate a greater dissimilarity in the fauna of these sub-divisions of the Upper Silurians than has hitherto been supposed to exist; at any rate it is quite certain that the description of these rocks and their fossil contents, as given by Murchison, would not afford the slightest idea that so great a change in the life of the period had taken place during the deposition of the intervening beds of Limestone and Shale.

In the above Lists I have followed the nomenclature adopted by Mr. Salter, in his work now in course of publication. He has already determined several new species and varieties, and an examination of these will lead to some interesting conclusions. Mr. Salter has accurately described the variations which occur in the following species, but (doubtless owing to wrong information as to the localities) he has failed to perceive a most important fact connected with these variations of form, viz.:—that, when we meet with a well defined variety or sub species, in most cases it is not found in the same locality as the parent species, or is not of the same age. The following examples will illustrate my meaning.

Cheirurus bimucronatus var. *A*. has the two central spines of the tail closely approximate—this form is from the Upper Shale of Dudley Tunnel. In var. *B*. centralis, the central spines are farther apart, and a short mucro protrudes between them. These specimens are from the Lower Shale of Malvern, and also occur as low down as the Caradoc Sandstone.

Phacops Musheni is a Lower Shale form, common at Malvern and the Rushall Canal—Phacops Stokesii, with which Musheni has been confounded, occurs in the Upper Shale only.

Cyphaspis megalops with a dorsal spine is common in the Upper Shale. Cyphaspis elegantula *without* spine is from the Lower Shale only. Phacops longicaudatus occurs in the Lower Strata only. Phacops caudatus first appears in the Limestone, and is continued through the Lower to the Upper Ludlow. I have placed Acidaspis coronatus in both lists, but have reason to believe that the specimens from the Upper Shale differ from those found in the Lower Shale of Malvern.

It may be well to repeat that the above observations apply to the two beds of *Shale* exclusively, and it will therefore, be understood that many of the species may, (and in fact do) occur in the intervening beds of Limestone; some make their first appearance there and range upwards, while other forms are continued from lower beds and then die out.

I have now referred to the leading facts connected with the distribution of Trilobites in these beds, and although I am quite aware that the subject has been introduced in a very incomplete form, still I think it well to call

your attention to it at once, in order to invite discussion and accumulate new facts. As I have already stated, Mr. Ketley and myself have for some time past turned our attention to the subject, our chief object being to prepare for the Meeting of the British Association more complete and reliable lists of the Fossils of the Upper Silurians of the district than have hitherto been published. The Members of this Society have unusual facilities for working out the necessary details, and I hope that those who feel an interest in these enquiries will assist by carefully noting the locality, and especially the relative position of the bed in which each specimen is found; by so doing we shall be able to accomplish for the Silurian Rocks what Mr. Etheridge and others have done for the Secondary Formations, and at the same time render a service to Palæontological Science which I think the Members of this Society are especially called upon to perform.

MEMBERS' LIST, FOR 1865.

N.B.—Any error or omission in the following Lists should be notified to the Secretary, also any change in Address of Members.

PATRONS.

RIGHT HONOURABLE THE EARL OF DUDLEY, Witley Court.

RIGHT HONOURABLE THE EARL OF LICHFIELD, Lord Lieutenant of Staffordshire.

RIGHT HONOURABLE LORD LYTTELTON, Lord Lieutenant of Worcestershire.

W. O. FOSTER, Esq., M.P., Stourton Castle.

H. F. VERNON, Esq., M.P., Hanbury Hall.

H. B. SHERIDAN, Esq., M.P., Fulham.

Rev. T. L. CLAUGHTON, Kidderminster.

HONORARY AND CORRESPONDING MEMBERS.

1 SIR CHARLES LYELL, Bart., M.P., M.A., D.C.L., L.L.D., F.R.S., &c., London.

2 SIR RODERICK IMPEY MURCHISON, K.C.B., G.C.M., M.A., D.C.L., F.R.S., &c., Director General of Geological Survey of the United Kingdom.

3 ANDREW C. RAMSAY, Esq., F.R.S., F.G.S., Director of the Geological Survey of Great Britain.

4 J. B. JUKES, Esq., M.A., F.R.S., F.G.S., Director of the Geological Survey of Ireland.

5 PROFESSOR JOHN PHILLIPS, M.A., L.L.D., F.R.S., F.G.S., Oxford University.

6 WARRINGTON W. SMYTH, Esq., M.A., F.R.S., F.G.S., Chief Inspector of Crown Mines.

7 ROBERT HUNT, Esq., F.R.S., M.R.A.S., F.G.S., Keeper of Mining Records.

8 ROBERT ETHERIDGE, Esq., F.R.S.E., F.G.S., Geological Survey of Great Britain.

9 EDWARD HULL, B.A., F.G.S., Geological Survey of Great Britain.

10 PROFESSOR TENNANT, F.G.S., King's College, London.
11 PROFESSOR BENTLEY, F.L.S., King's College, London.
12 Rev. W. F. LEIGHTON, M.A., F.B.S., Edin., Shrewsbury.
13 J. W. SALTER, Esq., F.G.S., London.
14 EDWARD W. BINNEY, Esq., F.R.S., F.G.S., Manchester.
15 EDWARD WOOD, Esq., F.G.S., Richmond.
16 CHARLES MOORE, Esq., F.G.S., Bath.
17 WALTER WILLIAMS, Jun., Esq., Hon. Sec. South Staffordshire Ironmasters' Association.
18 W. P. MARSHALL, Esq., Sec. Institute of Mechanical Engineers, Birmingham.
19 Rev. P. B. BRODIE, F.G.S., Rowington Vicarage, Warwick, V.P., and Secretary Warwickshire Naturalists' Field Club.
20 Rev. W. SYMONDS, M.A., F.G.S., Pendock Rectory, Tewkesbury, Pres. Malvern Field Club.
21 Rev. R. P. HILL, Bromesberrow Rectory, Ledbury, Hon. Sec. Malvern Field Club.
22 Hon. and Rev. W. H. LYTTELTON, M.A., Hagley Rectory, President Worcestershire Naturalists' Club.
23 EDWIN LEES, Esq., F.L.S., F.G.S., Worcester, Vice-President of Worcestershire and Malvern Field Clubs.
24 WILLIAM MATHEWS, Jun., Esq., B.A., F.G.S., Edgbaston, Hon. Sec. Worcestershire Field Club.
25 SIR W. V. GUISE, Bart., F.L.S., F.G.S., Gloucester, President Cotteswold Naturalists' Society.
26 ARTHUR THOMPSON, Esq., Secretary Woolhope Field Naturalists' Society.
27 HENRY DICKENSON, Esq., Coalbrookdale, President Severn Valley Field Club.
28 GEORGE MAW, Esq., F.L.S., F.S.A., F.G.S., Broseley, Vice-President Severn Valley Club.
29 C. J. COOPER, Esq., Bridgnorth, Hon. Sec. Severn Valley Field Club.

LIST OF ORDINARY MEMBERS.

Corrected up to 6th June, 1865.

1 Aston, John, Blowers Green, Dudley
2 Badley, Dr. (Life Member), Dudley
3 Bailey, Samuel, The Pleck, Walsall
4 Bailey, T. Abishai, Ocker Hill
5 Baker, J. P., Inspector of Mines, Wolverhampton
6 Baker, J. W., Birchills
7 Barnett, W., Coseley
8 Bateman, John, Dudley
9 Beckett, Henry, F.G.S., Wolverhampton
10 Beddow, John, Moxley, Wednesbury
11 Bennitt, Captain (Life Member) J.P., Stourton
12 Bennitt, Joseph, (Life Member) Ashwood, Kingswinford
13 Blackwell, S. H., F.G.S., Dudley
14 Bowkley, Silas, F.G.S., Batman's Hill
15 Bowkley, Alfred, Batman's Hill
16 Bretell, Thomas, Dudley
17 Bromley, James, Moxley
18 Browne, Rev. J. C., D.C.L., Dudley
19 Burton, Henry, Dudley
20 Ballenden, Henry, Surgeon, Sedgley
21 Bolton, Thomas, Hyde House, Stourbridge
22 Badley, J. P., M.D., Dudley

23 Claughton, Rev. T. L., Kidderminster
24 Capewell, L. P., Dudley
25 Cartwright, Cornelius, (Life Member) M.D., Dudley
26 Cartwright, Rev. W. H., (Life Member)
27 Cooksey, Joseph, F.G.S., Westbromwich
28 Cooksey, J. H., Westbromwich
29 Cope, James, Pensnett
30 Collis, W. B., Stourbridge
31 Cochrane, Thomas, Surgeon, Dudley
32 Crewe, Thomas, Dudley
33 Cole, J., Wren's Nest, Dudley
34 Coulton, W. Gordon, Solicitor, Dudley

35 Dudley, Right Honourable Earl of, Witley Court
36 Davis, William, Bilston
37 Dawes, J. S., Smethwick House

38 England, George, Dudley
39 Eagles, Henry, Walsall

40 Foster, W. O., M.P., Stourton Castle
41 Forster, Charles, M.P., Haunch Hall
42 Fellows, Titus, Great Wyrley
43 Fellows, J. U., Walsall
44 Finch, John, Dudley
45 Fletcher, Captain, M.A., F.R.S., F.G.S., Lawnswood
46 Fraser, John, M.A., M.D., Wolverhampton
47 Fereday, S. D., Surgeon, Dudley
48 Ford, W. H., Goldthorn, Wolverhampton
49 Firmstone, H. O., Wollaston Hall, Stourbridge

50 Gibbons, Benjamin, Hill Hampton House, Stourport
51 Gibson, Rev. M., Dudley
52 Grainger, Edward, Dudley

53 Haden, William, Dudley
54 Haden, W. H., Dudley
55 Hayward, W. H., Surgeon, Oldbury
56 Higgs, T. F., Surgeon, Dudley
57 Hollier, E., Dudley
58 Horton, G. E., Surgeon, Dudley
59 Hopkins, John, Dudley Port
60 Homer, F. A., Sedgley
61 Hunt, J. P., Corngreaves, near Birmingham
62 Holcroft James, Portfield Iron Works, Dudley

63 Jesson, Thomas, Westbromwich
64 Jenks, William, Upper Penn
65 Jones, Edward, The Larches, Handsworth
66 Johnson, Henry, Dudley
67 Johnson, Henry, Jun., Dudley
68 Jones, Edward, Bentley, Walsall

69 Kettle, Rupert, Judge of Worcestershire County Courts, Wolverhampton
70 Ketley, Charles, Dudley

71 Lichfield, Right Honourable Earl of, Shugborough
72 Lyttelton, Right Honourable Lord, Hagley
73 Latham, Thomas, Dudley
74 Lees, D. W., Willenhall
75 Lloyd, Sampson, Wednesbury
76 Lloyd, S. Z., Wednesbury
77 Lloyd, Samuel, Wednesbury
78 Lloyd, Wilson, Woodgreen
79 Lloyd, E. R., Birmingham
80 Loveridge, Henry, Wolverhampton
81 Leech, Alexander, Tipton

82 Mathews, William, F.G.S., The Leasowes
83 Mander, C. B., Wolverhampton
84 Madeley, William, Tiled House
85 Macdonald, John, Moat Colliery
86 Marsh, Edwin, Burnt Tree
87 Marten, Edwin, C.E., Stourbridge
88 McGhie, Robert, Corngreaves Iron Works
89 McGhie, Thomas, Cannock Chase Colliery
90 Mills, Samuel, Dudley

91 Millward, William, Dudley
92 Moreton, John, Jun., Wolverhampton

93 McLean, J. R., C.E., F.G.S., Great George Street, Westminster
94 Parton, Thomas, Willenhall
95 Peacock, David, Tipton
96 Perry, F. C., Dunston, Stafford
97 Phillips, C. J., Birmingham†
98 Piggott, Francis, Cannock
99 Renaud, E. J., Dudley
100 Roper, H. C., Dudley
101 Roper, Thomas, Bilston
102 Rutter, Mrs., Wolverhampton
103 Rose, Thomas, Millfields Iron Works
104 Rose, Daniel, New Village
105 Rose, E. F., Moxley
106 Rooker, Rev. J. Y., Lower Gornal
107 Robinson, Brooke, Coroner, Dudley
108 Sheridan, H. B., M.P., Fulham
109 Shelley, E., Wolverhampton
110 Smallman, Elihu, King's Hill
111 Smallman, Josephus, Burnt Tree
112 Smith, E. F., Dudley
113 Smith, Frederick, M.A., Priory, Dudley
114 Solly, James, Toll End House
115 Spruce, William, Pensnett
116 Spruce, Samuel, Tamworth
117 Stokes, Joseph, Solicitor, Dudley
118 Strongitharm, H. H., Rushall
119 Smith, William, Hednesford
120 Tarratt, H. W., 21, Parliament Street, Westminster
121 Taylor, George, Estates Office, Dudley
122 Terry, E., Jun., Dudley*
123 Thomson, George, Hill Top
124 Twamley, Miss, Edgbaston
125 Turner, E. B., Wednesbury†
126 Vernon, H. F., M.P., Hanbury Hall
127 Ward, Henry, F.G.S., Wolverhampton
128 Wright, Joseph, Dudley
129 Westley, Charles H., Dudley
130 Whitmore, J., Dudley
131 Whitley, Joseph, Cradley Heath
132 Westwood, W. H., Brierley Hill
133 Woodcock, W. G., Eagle Iron Co., Westbromwich
134 Wright, Joseph, Ivanhoe Place, Dudley

ADDENDUM.

135 Bullock, E. L., Spon Lane
136 Hall, John, Amblecote

* Become Field Club Members. † Resigned.

LIST OF FIELD CLUB MEMBERS,

Corrected up to 6th June, 1865.

1 Addenbrook, Rev. E., Smethwick
2 Allport, Samuel, Birmingham
3 Auden, Rev. W., Derby
4 Aulton, A. W., Walsall
5 Albright, Arthur, Oldbury
6 Akroyd, Mrs., Stourbridge
7 Akroyd, Miss, Stourbridge
8 Bankes, Miss, Dudley
9 Banks, Edward, Tettenhall
10 Bailey, William, Oaken, W'hampton
11 Beckett, Miss, Pennover
12 Beckett, Miss M. A., Pennover
13 Beckett, Percy, Pennover
14 Beckett, H. H., Pennover
15 Bain, Rev. J. W., Bilston
16 Bidwell, Henry, Albrighton
17 Bernard, G., Solicitor, Stourbridge
18 Biden, Henry, Brierley Hill
19 Bourne, William, Dudley
20 Bowen, J., Bilston
21 Britten, Charles, Wednesbury
22 Brooke, W. H., Solicitor, Dudley
23 Burns, Thomas, Wolverhampton
24 Buck, R. C., Dudley
25 Bowlby, Rev. H. B., Oldbury
26 Brown, Ralph, Wednesbury
27 Bidlake, George, Wolverhampton

28 Cooksey, Miss, Westbromwich
29 Cooksey, Miss E. A., Westbromwich
30 Cooper, William, Wolverhampton
31 Cartwright, Mrs., The Leasowes
32 Compson, Rev. J., Great Wyrley
33 Cotterill, William, Walsall
34 Checkley, Samuel, Pelsall
35 Cartwright, James, Dudley
36 Cartwright, Henry, Dudley
37 Colman, J. M., Surgeon, W'hampton
38 Chapelle, L., Willenhall
39 Cope, J., Albrighton
40 Chambers, J., Wolverhampton
41 Cooper, Gilbert, Surgeon, Oldbury
42 Collis, E. J., Stourbridge
43 Carter, Thomas, Seaforth, Liverpool
44 Claridge, C., Bilston

45 De Lessert, C. J., Wolverhampton
46 De Lessert, A., Wolverhampton
47 Dalton, Rev. George, Wolverhampton
48 Duignan, W. H., Walsall
49 Deakin, F., Wednesbury
50 Dodd, Richard, Goldthorn Hill, Wolverhampton
51 Dickenson, Samuel, Pennfields
52 Dulley, Joseph, Wolverhampton

53 Evans, Sebastian, Highgate, Birmingham
54 Evans, Rev. David, Dudley
55 Evers, Miss, Oldswinford

56 Flewker, William, Pennfields
57 Frost, M., Wednesbury
58 Frost, James, Wednesbury
59 Fisher, Thomas, Pennfields
60 Fisher, W. H., Oak Farm, Kingswinford
61 Farley, Reuben, Great Bridge
62 Fellows, F. P., Goldthorn hill, Wolhampton
63 Ford, J., Pennfields
64 Fennell, S., Surgeon, Cradley
65 Fleeming, William, Pennfields
66 Fleeming, Miss, Pennfields
67 Fleeming, Miss, Pennfields
68 Fellows, George, Great Wyrley
69 Fisher, Henry, Midland Bank, Wolverhampton

70 Gay, Rev. W., Pennfields
71 Gill, William, Middleton-on-Tees
72 Green, J., Westbromwich
73 Grier, Rev. J. W., Stourbridge
74 Griffin, W. D., Wolverhampton
75 Griffin, G. R., Tettenhall
76 Gray, Charles, Bilston
77 Green, J. C., Dudley
78 Gover, Rev. W., Training College, Saltley
79 Green, Robert R., Engineers' Office, Blackheath

80 Holden, E. T., Walsall
81 Higham, Frederick, Wolverhampton
82 Higham, George, Wolverhampton
83 Hambleton, Joseph, London
84 Hollier, E. J., Dudley
85 Hatton, J. T., Great Wyrley
86 Heming, W. T., Redditch
87 Heafield, Rev. J., Bilston
88 Hodgetts, C. B., Corngreaves
89 Horton, F. C., Wolverhampton
90 Hamp, John, Wolverhampton
91 Hough, Joseph, Wrottesley Observatory
92 Haines, Job, Tipton
93 Houghton, Robert, Dudley
94 Horton, James, Handsworth
95 Holcroft, Charles, Portfield Iron Works, Dudley
96 Houghton, John H., Dudley
97 Hayes, E. J., Town Clerk, Wolverhampton
98 Howells, William, Tipton
99 Hague, John, Bilston
100 Haines, Edward, S., Brierley Hill
101 Hooper, Edwin, Coroner, Westbromwich
102 Hickman, George, Westbromwich
103 Hipkins, David, Westbromwich

104 Hatton, William, Broadwaters, Kidderminster
105 Hatton, William, Wolverhampton
106 Hatton, Henry, Wolverhampton
107 Haines, Richard, Tipton

108 Iles, Rev. I. H., The Rectory, Wolverhampton
109 Jabet, George, Handsworth
110 Jebb, George, Shrewsbury
111 Ironmonger, Thos., Tettenhall
112 Jones, W. H., Brierley Hill

113 Ketley, J., Edgbaston
114 King, W. H., Wollascote Hall, Stourbridge
115 Kitson, J., Solicitor, Wolverhampton
116 Kelly, Rev. J., Wolverhampton

117 Lowe, G. Burn, Dudley
118 Longman, Rev. Dr., Sedgley Park School, Wolverhampton
119 Laxton, W. H., Dudley
120 Lea, William, Jun., Goldthorn Hill, Wolverhampton
121 Lea, John, Jun., Goldthorn Hill, Wolverhampton
122 Lewis, Rev. Geo., Dudley
123 Law, W. C., Wolverhampton
124 Lewis, George, Coleorton, Ashby-de-la-Zouch

125 Marshall, John, Wolverhampton
126 Manby, John, Surgeon, Westbromwich
127 Mander, S. S., Wolverhampton
128 Mc Gahren, Rev. J., Walsall
129 Moore, Rev. Canon, Sedgley Park School, Wolverhampton
130 Marsh, Samuel, Oldbury
131 Millward, John, Stourbridge
132 Mc Clatchey, A., King's College, London
133 Manby, Cordy, Kingswinford
134 Murcott, John, Pennfields
135 Murcott, Daniel, Pennfields
136 Massey, Rev. C., Great Bridge

137 Newman, William, Walsall
138 Noott, Rev. E. H. L., Dudley
139 Newbolt, Rev. H. F., Bilston
140 North, W. Tipton

141 Owen, J., Solicitor, Dudley
142 Poole, Edwin, Dudley
143 Powell, Thomas, Surveyor, Tipton
144 Powell, Thomas, Goldthorn Hill, Wolverhampton
145 Perry, George, Oldswinford
146 Piggott, John, Cannock
147 Puddicombe, A., Surgeon, Wolverhampton
148 Pickett, Jacob, Surgeon, Wolverhampton
149 Paley, Rev. F., Penn
150 Pugh, Edward, Bilston
151 Perrens, G. R., Stourbridge
152 Perry, Thomas, Tettenhall
153 Peake, E. C., Rugeley

154 Roberts, William, Tipton
155 Rabone, J., Birmingham
156 Robinson, J. R., Walsall
157 Rogers, J. K., Ynisceedwyn Iron Works, Swansea
158 Rudge, Samuel, Dudley
159 Rollason, Thomas, Surveyor, Westbromwich
160 Rose, David, Moxley
161 Richards, T., Surveyor, W'hampton

162 Sheppard, Thomas, Dudley
163 Smith, George, Dudley
164 Slade, Rev. J. J., Netherton
165 Shaw, R. E., Pennfields
166 Shaw, — Walsall
167 Stone, Rev. J., Capponfield
168 Simcox, Rev. T. G., Smethwick
169 Slater, Rev. T., Coseley
170 Southern, Thomas, Wednesbury
171 Silvester, W., Smethwick
172 Silvester, Miss, Smethwick
173 Shedden, J. J., Walsall
174 Simpson, Thomas, Wolverhampton
175 Smith, Henry, Kingswinford
176 Smith, John, Surgeon, Coseley

Permian is absent in the Tyrol and South of Europe.

Trias is well seen in Grödner Thal with characteristic Muschelkalk fossils; and at Recoaro, where it rests on mica schist and is capped with dolomite. (See the section of the Spitze of Recoaro.) It is not so clearly seen in North Tyrol, and seems wanting in the Western and Central Alps.*

Jurassic:—Our lias and oolite near the igneous district of South Tyrol and Venetia, is often changed into magnesian limestone (dolomite), and in the Western Alps into sulphate of lime, (gypsum), as in Aix thermal springs.†

Our Portland limestone though plentiful in the Jura, is wanting in the Alps.

Cretaceous.—The base is Neocomian, which is a thick and important part of the system. Above this is the scaglia, and still higher the Inoceramus. These represent our chalk.

Tertiary.—The lowest Alpine zone of this formation is nummulitic, probably middle eocene, though formerly classed as cretaceous.

Mountains north of Lake Wallenstadt, shew an instructive section giving the sequence of these rocks, and comprising Jurassic, Neocomian, Inoceramus, Nummulitic, and flysch.

Grünten Mountain, east of Immendstadt, 6,000 feet high teaches the succession of cretaceous and eocene. Its top being Upper Neocomian, which has a large horizon in the calcareous regions of the Alps, Mount Pilatus for instance.

Similar sequence of Cretaceous and Tertiary may be learnt east of Sette Communi, in Venetia. Above the scaglia is nummulitic, and above it, younger tertiaries highly inclined by upheaval.

I saw plenty of scaglia on headlands, between Recoaro and Vicenza. At Valdagno, it is overlaid by eocene coal seams with nummulitic above.

Monte Bolca too has nummulitic, containing lignite and tertiary shells.

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* The salt mines are chiefly near the point where Tyrol, Upper Austria, and Bavaria meet. I descended one at Hall, by an amusing kind of glissade. Water is introduced into the salt marl chambers, and the brine when strong enough is pumped up, and often carried in pipes, many miles over hill and dale to the forests, which supply fuel for the evaporating houses, coal being little known in this country.

† The Dolomitic Region is in the South Eastern part of the Tyrol, and the adjacent parts of Venetia. It is difficult of access, and almost unknown to travellers. But since the recent publication of Gilbert and Churchill's "Dolomite Mountains," English tourists will no doubt be attracted by the wonderful scenery produced by their stupendous precipices and fantastic peaks. Those who wish to go fully into the geology of this peculiar district must study the graphical descriptions, map and coloured sections in the quarto volume, published in 1860, by Baron von Richthofen. I have also been much indebted to Murchison's learned and masterly illustration of the Geology of the Alps in the Quarterly Journal of the Geological Society, vol. 5., part I.