

PROCEEDINGS OF THE
DUDLEY AND MIDLAND
GEOLOGICAL & SCIENTIFIC SOCIETY,
AND FIELD CLUB.

No. 2.

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July, 1869.

A COMMITTEE MEETING was held at Dudley, October 30th, 1862, present Messrs. Beckett, Fraser, Capewell, and the Secretaries.

The following Members were elected :—George England, Miss M. Fellows, Rev. R. Twigg, J. R. Robinson, Henry Eagles, S. Evans, Rev. Dr. Browne, Rev. J. C. Browne, F. Simpson, J. Whitly, G. Jabet, T. Baker, T. H. Hatton, W. Marsh, F. Aulton, J. Bowen, H. Roper.

Arrangements were made for holding a joint Public Meeting and Scientific Exhibition with the Committee of the Mechanics' Institute, on the occasion of laying the Foundation Stone of the Dudley Institute, the proceeds, if any, to be devoted to the Building Fund.

It was resolved that the proceedings of this Society be issued half-yearly, as soon after December and June in each year, as practicable.

As the Committee had no room of their own and as it was thought desirable to have Meetings of the Society during the winter, a series of Field Meetings was arranged to be held in the months of November, December, January, and February.

The first winter field meeting was held on November 11th, at Pouk Hill, a Basaltic patch about midway between Walsall and Willenhall. Seventeen members of the Society mustered from various points, and by eleven o'clock were in the famous quarry which lies hidden in the summit of a small rising ground just to the right of the high road. The peculiarity of the Basalt in this place consists in the well defined columns which lie exposed along the whole of the northern face. The material is precisely the same as the Rowley Rag farther to the west. Many of the columns are upwards of 20 feet in height, and being broken off in the process of quarrying, expose a pentagonal surface more or less perfect. On all sides the columnar structure of the Basalt is perceptible, and a remarkable feature in the general aspect of the

part now exposed is that the columns appear to bend over towards a point which once formed the summit of the knoll, but which quarrying operations have since removed. The party were favoured with full explanations of the structure of the hill, and the relation of this basalt to another mass a little farther to the east, by Mr. George, who exhibited various sections shewing the position of the igneous rock to the coal measures around. From these it appears evident that the molten mass was intruded between the lower coal measures early in the Carboniferous period, and possibly had its origin in the Rowley centre, though of earlier age than the basalt in that neighbourhood. It was formerly considered probable that some central pipe existed beneath the hill, through which the basalt had been forced; but recent mining operations in getting the "Blue Flats" Ironstone have satisfactorily proved that there is no such channel of communication with the interior of the earth. About 200 yards to the south, the igneous rock may be noticed in immediate contact with the Bottom Coal, which is being obtained by the "open" working. The underlying coal has been changed to Anthracite owing to the action of the intrusive rock; but in another section it was noticed that the shales *above* the basalt have not been altered, and hence it may be supposed that the outburst was immediately after the deposition of the Bottom Coal. In an adjoining shaft the Silurian limestone has been reached, and numerous fossils were obtained from the spoil banks.

A communication was made by Mr. L. P. Capewell relative to a fragment of *Pterygotus*, which he had obtained from the Wenlock beds (Lower Ludlow?) at Parks's Hall, near Dudley. This Crustacean ranges as low as the Caradoc series, but very few specimens have been discovered in the neighbourhood of Dudley.

On Friday, November 29th, a considerable number of members took part in the proceedings connected with the laying the Foundation Stone of the New Mechanics' Institute in Dudley, which is to contain the Geological Museum. The Earl of Dudley performed the ceremony, and delivered an Address. Lord Lyttelton and Mr. S. H. Blackwell also addressed the Meeting.

In the evening a *Conversazione* and Scientific Exhibition was held in the Rose Hill School Room, which was attended by about 300 members of the Geological Society and Mechanics' Institution, under whose joint management the arrangements were made—Lord Lyttelton presided, and Revs. J. W. Grier, Evans, Lewis, Messrs. F. Smith, S. H. Blackwell, H. Beckett, and George Taylor, delivered addresses. The following gentlemen kindly furnished the objects for Exhibition:—

Mr. S. H. Blackwell.—Fossils, Hydro-Electric Machine, &c.

Mr. H. Beckett.—Geological Diagrams.

Professor Tennant (London).—*Model of Gold Nuggets*.

Messrs. Negretti & Zambra (London).—Philosophical Apparatus, Photographs, &c.

Professor Bentley (London).—Botanical Specimens.

Messrs. Field & Sons (Birmingham).—Microscopes and Apparatus.

Mr. Breeze (Birmingham).—Photographs, Stereoscopes and Views.

Worcestershire Union of Institutes.—Diagrams.

Mr. Mander (Birmingham).—Stereoscopes and Views.

Mr. Capewell.—Mineralogical Specimens from the Gold Fields of Australia, Models of Gold Washing Apparatus, Australian Curiosities, and a series of Fossils from various formations.

Dr. Fraser.—Botanical Specimens.

Rev. J. H. Thompson.—Specimens from Naples.

Mr. H. Johnson.—An extensive series of Carboniferous and Silurian Fossils, Safety Lamps, &c.

Mr. Ketley.—Fossils.

Mr. Hough.—Astronomical Diagrams.

Mr. Ronaldson.—Ores and Models.

Mr. R. C. Buck.—Local Stereoscopic Views.

Mr. Jones.—A selection of Fossils from the Lias, Oolite, Chalk, and other formations.

Mr. Talbot.—Sketches and Diagrams.

Mr. E. J. Hollier.—A collection of Trilobites and other Silurian Fossils, Photographs and Apparatus, Entomological Specimens, &c.

Mr. E. Hollier.—Electrical, Electro-Magnetic, and Pneumatic Apparatus, Micrographs, Views, &c.

Mr. Woodhouse.—Illustrations of the Natural History of the District.

Microscopes, Stereoscopes, and Photographs, by Messrs. Capewell, Grey, Houghton, Wright, Hollier, and other friends of the Institute.

A communication was received from the Rev. W. Symonds, President of the Malvern Field Club, in which, after congratulating the promoters of the Dudley Society on the success which had attended their efforts, he alluded to the establishment of the Museum in the New Institution, and suggested that the Fossils illustrating the Geology of the District should be carefully arranged and placed in a prominent position. The Paper also contained suggestions relative to the Winter Meetings, and the publication of the Society's transactions.

MR. CHARLES TWAMLEY, read a Paper on "Some interesting facts connected with the History of Dudley," an abstract of which is appended.

REV. J. H. THOMPSON gave some particulars of his recent visit to Italy, and explained various specimens from that country which he had placed in the Exhibition.

The collection of Fossils from the cabinets of Messrs. Johnson, Capewell, Ketley, and E. J. Hollier, was particularly extensive, and the members had thus an excellent opportunity of examining the organic remains of the district. Owing to the expense of getting up the Exhibition, and the very short time it was open, (being Friday there was no means of continuing it for a longer period), the expenses were scarcely met by the receipts. On this occasion the Earl of Dudley was pleased to give permission for the members to visit the Wren's Nest and Castle Hills in search for fossils, at any time, on producing their cards of membership.

On December 10th, the second winter field day was held at Corngreaves, for the purpose of examining the contorted Coal measures, which have been met with in recent workings at the New Baremoor Pit. Professor Jukes, in his memoir on the South Staffordshire Coal Field, mentions the peculiar intrusion of Sandstone which is here found in connection with the upper beds of

the Thick Coal. Since the publication of this memoir, the workings have been considerably extended, and even more remarkable features have been discovered. Mr. J. P. Hunt kindly accompanied the party, and explained the peculiarities of the mine.

On the same day a Committee Meeting was held, which was attended by Rev. J. H. Thompson, Messrs. Beckett, Capewell, and the Secretaries:

The following were elected members of the Society:—Lady Ward, Henry Bowater, Benjamin Peacock, J. Green, J. C. Manby, E. J. Hollier, P. Harris, and E. Marten.

It was resolved that the best thanks of the Committee be given to J. P. Hunt, Esq., for the facilities which he afforded the members for inspecting the Baremoor Coal Pit.

It was also decided to issue an Illuminated Card of Membership, which has since been designed by Mr. Charles Sturtevant, and forwarded to members.

The third winter field day was held in the neighbourhood of the "Fighting Cocks," Wolverhampton, the main object of the meeting being to examine the position of the Silurian beds at their northern termination. By the aid of numerous plans and diagrams Mr. Beckett explained the faults which traverse the district, and also the relative position of the Coal to the Silurian beds. A few wild flowers, including *Petasites vulgaris* were obtained even at this early season of the year.

The last winter meeting was held at the Wren's Nest, on February 17th, when upwards of forty members attended. The chief object of the meeting was to examine the central portion of the Hill with particular reference to the faults which have been discovered in the recent workings. A considerable time was spent in determining the cross faults which intersect the portion of the hill under examination, and several new lines of dislocation were laid down. The spoil banks at Parks's Hall reservoir and Ashfield, which, in all probability, represent the Lower Ludlow Shale, (Salter,) were visited, and at the latter place numerous fossils were obtained, in a good state of preservation. After passing along the eastern side of the Wren's Nest, the party dined together at the Saracen's Head, Dudley.

A Committee meeting was held at Dudley, March 17th; Rev. J. W. Grier, Messrs. Beckett, Stokes, Capewell, and the Secretaries attended.

The following were elected members:—W. Bailey, James Horton, Rev. J. Rowe, Rev. T. Tozer, T. Heming, A. De Lessert, Rev. J. Y. Rooker, T. R. Colman, T. Richards, F. C. Horton, J. Simpson, J. Ketley, W. Richardson, J. Westley, W. Bourne, and W. H. Brooke.

Arrangements were made for the Annual Meeting in March, and also for the summer field days at the Lickey Hills, Malvern, Stiper Stones, Matlock, and Wenlock.

A Special Sub-Committee from the Mechanics' Institution attended to confer with the Committee as to the terms on which the two Societies should be affiliated for certain operations, in the new building, when the following regulations were agreed upon:—

1. That the Museum which is now the property of the former Dudley Geological Society shall, on its transfer to Trustees to be hereafter named, be placed and kept in the building now in course of erection in Wolverhampton Street, Dudley, and in that part of the building now marked in the plan as the Museum.

2. That in consideration of the Members of the Dudley and Midland Geological and Scientific Society and Field Club subscribing to the funds of the new building, they shall have the free use and enjoyment of the said Museum, in common with the Members of the Mechanics' Institute.

3. That the Geological Society shall be responsible for the arrangements of the Museum, and shall appoint a Curator for the same, and shall pay annually to the Mechanics' Institute £5., or such other sum as shall be mutually agreed upon between the two Societies, towards the expenses of cleaning, &c.

4. That any person shall be at liberty to deposit Fossils, Minerals, or other property in the Museum, in any one of the following ways:—

a. GIFT TO THE MUSEUM,—In which case the property so deposited shall become the property of the Special Museum Trustees.

b. LOAN TO THE MUSEUM,—In which case the depositors shall be at liberty to take away the property so deposited, at any time, on giving one month's notice, in writing, to the Curator.

c. GIFT TO THE GEOLOGICAL SOCIETY,—In which case the property so deposited shall belong to the Trustees of the Geological Society, and shall remain in the Museum as long as the two Societies are affiliated.

5. That all specimens so deposited in the Museum shall be labelled, and particulars as to the mode in which they are deposited shall be entered in a book to be kept by the Curator for that purpose, and to be signed by the depositor, so that any dispute as to ownership may be prevented.

6. That the Mechanics' Institution shall be at liberty to admit the general public to the Museum upon such terms as they shall think fit.

7. That the Geological Society shall have the free use of one of the small committee rooms as often as they shall require the same.

8. That the Trustees of the Mechanics' Institute shall be at liberty to determine the foregoing agreement by giving to the Trustees of the Geological Society three years' notice, in writing.

The following Donations from Members of the Geological Society, in aid of the Building Fund of the Institute, were announced:—

	£	s.	d.
Miss Twanley	5	0	0
H. Beckett, Esq.	5	0	0
E. Smallman, Esq.	2	0	0
Dr. Wollaston	2	0	0
— Turner, Esq.	1	0	0

In the evening of the same day a Meeting was held in the Assembly Room, when Papers by Messrs. Hough, Johnson, Hollier, and Jones were read and discussed. Mr. H. Beckett occupied the Chair.

Mr. Hough (Wrottesley Observatory), read a Paper on "Some points of connection between Astronomy and Geology."

In commencing his paper, Mr. Hough remarked on the tendency of all the

sciences as they progressed, to converge into one grand cosmogony. Already Professor Jukes divides sciences into two great branches, astronomy and geology; and these even have at their basis so many points in common that it is difficult to say where one ends and the other begins. When geology shall have risen from a study of effects to a demonstrable knowledge of causes, it will be by this knowledge that astronomers will interpret the phenomena of the moon and planets presented to us by the telescope. For, because we see on the moon mountains and valleys and the evidence of volcanic action on some of the planets, land and water, vapour and snow, and the action of great equatorial currents, we cannot doubt that they have been subject to modifications similar to what our own globe has undergone. Meanwhile astronomy furnishes most important data to the geologist—data which form the basis both of astronomy and geology; and it is because these data were ready shapen to the hands of the geologist that geology has been enabled to make such a marvellous progress in the short space of forty years.

First among these come the figure and dimensions of the earth. That the earth is globular was known to the Greeks, but its true geometrical figure was first given by Newton, who showed that, in consequence of the centrifugal force at the earth's equator, its shape must deviate from an exact sphere, and be changed into an oblate spheroid. Newton calculated the ellipticity of this spheroid on the assumption that the earth is homogeneous, or composed of the same class of materials from its surface to its centre. He found on this hypothesis the ellipticity to be 1·230th, but when astronomers succeeded in measuring with a land surveyor's chain, the actual dimensions of the earth, the ellipticity was found to be much less than 1·230th being only 1·306th. This showed at once that Newton's hypothesis of the homogeneity of the earth was not true, and that really it became more and more dense from the surface to its centre. The knowledge of the earth's rotation on its axis, together with the action of the sun, supplies the principal causes of oceanic currents. The gravitating action of the moon on the ocean continually endeavouring to arrange its waters in an ellipsoidal shape causes the bi-diurnal tide, and thus the two great aqueous causes of geological change are of astronomical origin. These are immense steps forward. To discover and demonstrate them required the concentrated intellect of ages, and without them geology would be altogether impracticable. Another class of astronomical truths which are important to the geologist, are those which set limits to his speculations. Thus, to account for the fossil remains of plants and animals found in the polar regions, some have supposed the axis of the earth to have changed its position. Astronomy shows this is impossible, so that as far as the sun is concerned what are now Arctic regions have in all geological time been the same. On the question of the internal constitution of the earth astronomy supplies definite information. All geological facts unite to show that the temperature of the earth was once very much higher, and the forces which have moulded its crust correspondingly more powerful than is the case now. Some, such as the greater amount of quartziferous rock in, and the firmer consolidation of the more ancient strata, seem to indicate a gradual cooling of the earth from a heat amounting once at least to redness. These, in conjunction with the well-known fact of the regular increase of temperature in descending mines, &c., seem to confirm the theory that the whole of the interior of the earth is one molten mass. Here, however, astronomy interposes, and shows

that to produce the observed "precession of the equinoxes" the earth's crust must be at least 800 miles thick. So that to demonstrate the true cause of the former high temperature of the earth is a problem which yet awaits a solution.

Mr. E. Hollier next read a Paper on the "Geology of the Castle Hill, with special reference to some of its peculiar Fossils."

He invited the members to an imaginary stroll round the Castle grounds at Dudley, and alluded to the many beauties which may be discovered at every step. He would, however, ask them to go back beyond the history connected with the wreck of the noble ruins which crown the hill, to a time before man dwelt within the now blackened walls, or before the ground on which they stand was fitted for his existence. The Hill is composed of beds of Wenlock shale alternating with two bands of limestone,—the upper or thin bed, and the lower or thicker layer. The Castle grounds, including Kettle Hill, may not inaptly be said to represent in general outline, a pear, having the broader part to the South or town end of the enclosure. It appears to have been originally surrounded by the two layers of limestone before mentioned, separated by about 30 yards of shale and both cropping out at the summit. Each limestone bed has been almost entirely removed either by open work or mining operations carried on by means of extensive galleries. With the exception of a small portion near the Castle street entrance and behind St. Edmund's Parsonage, the thin limestone has been completely excavated. Facing the railway station a ravine commences, and here a fish pond formerly existed. From this quarry, and from measures called the two feet gray, some of the finest Encrinites have been obtained. During the working of these thinner measures a tunnel was driven about 60 yards through the shale and bavin, into the thick limestone beyond, and was continued right and left for some distance—It was in this locality that the beautiful *Homalonotus delphinocephalus*, now belonging to Mr. S. H. Blackwell, was found, together with several fragments of the same species, and one or two more or less perfect specimens. For many years no remains of this crustacean were discovered; but very recently the Author had obtained a large and perfect specimen, and also several smaller ones. These remarkable fossils appear to be confined to a layer, about three feet in thickness, which overlies the measures worked for sale. In some places they seem to have congregated in considerable abundance. The *Homalonotus* has a wide range, as it passes through the Lower, Middle, and Upper Silurian rocks, but is very rare in the Dudley beds. Now and then good specimens of *Calymene Blumenbachii*, and also fragments of *Pterygotus* have been obtained from this layer. Messrs. Keiley and Capewell have also specimens of this fossil from the beds above and corresponding with the Castle Hill series. (Corals and Shells from this stratum were exhibited.) Proceeding towards the North, various openings may be seen extending into the old workings, and here Encrinites are occasionally obtained, but they generally occur in very massive slabs of limestone. Passing on, under what was once a large rookery, good sections (exposed at the canal basin) are presented to view, as also is the case in a small ravine farther west, where numerous fossils have been procured. At Kettle Hill, the extreme North of the Castle grounds, some rather rare fossils for the Dudley district have been found, including the *Ilænus Barriensis*. At the time of the erection of the CASTLE

MILL WORKS, when a considerable quantity of shale was removed, many fossils were found, including fine specimens of *Calymene*, *Phacops*, *Encrinites*, &c., but the beds now exposed are said to be too far back to afford many specimens. Although the Hill is belted, as it were, with the two layers of limestone, they crop out at the summit, leaving the crown of the range between the line of outcrop composed of the soft *bavin* and *shale*. Into the thick limestone measures of the Western side, the excavations, now forming the famous "Dudley Caverns," have been carried about 800 yards, and exhibit in a beautiful manner the inclination, structure, and mode of working the beds. But few fossil remains have been found here, nor indeed are they so abundant in the lower measures as in the shale immediately above; but when they do occur they are almost invariably in a fine state of preservation. Leaving these dark and sombre scenes, and taking the walk leading towards the Castle, the large ravine along the summit of the Hill is reached, and here a beautiful view of the tops of the Castle ruins may be obtained. Following in the same direction by the side of the ravine, where several good sections may be studied, the court-yard is reached, where a glance at the ruins themselves will at once indicate the uses to which the stone from the ancient quarryings which we see on the sides and towards the top of the hill, was applied. In contemplating these extensive ruins the mind is carried far back to the period when the Dudley Limestone excavations were commenced; but even this is as nothing when compared with the remote era when the vast myriads of organic remains which crowd these rocks were created. Our means of computing time signally fail, if we endeavour to estimate the remoteness of that period, when "their sloping precipices, situated as they now are in central England, once formed a deep sea bottom far out of reach of land, whose green recesses were whitened by innumerable corals and corallines, amid which ancient shells that loved the profounder depths, *terebratula*, *orthis*, and *spirifer*, lay anchored, whilst innumerable trilobites crept sluggishly above zoophyte and mollusc on the thickly inhabited platform; and the *orthoceras* and the *bellerophon* floated along the surface high over head."* Here we have, more beautifully preserved perhaps than in any other place, these interesting records of a past age. "In Germany, in America, and in other parts of our own country, it is true they may be found, but nowhere so abundantly, so well defined, and in so great variety, as in this locality; and long may our Society flourish to become one of the means whereby the facts and incidents connected with their existence may be brought more prominently and usefully before the world of Science."

The Paper was illustrated by diagrams and fossils from the cabinets of Messrs. Ketley and E. J. Hollier. The following is a list of the principal fossils which were exhibited from the Castle Hill:—

<i>Homalonotus delphinocephalus</i>	<i>Calymene Blumenbrachii</i>
<i>Illænus Barriensis</i>	<i>Pterygotus problematicus</i> (fragments)
<i>Pterinea retroflexa</i>	<i>Cornulites serpularius</i>
<i>Favosites Gothlandica</i>	<i>Phacops Downingiæ</i>
<i>Ceratiocaris</i> sp.	<i>Crotalocrinus rugosus</i>
<i>Avicula</i> , sp.	<i>Orthoceras</i> , sp.
<i>Cyathophyllum articulatum</i>	<i>Modiolopsis</i> , sp., &c., &c.

Mr. H. Johnson read the following Paper on the "Practical application of Geology to the Industrial Pursuits of the South Staffordshire Mineral District."

[This Paper was originally set up for private publication by the Author, and hence it is not uniform with the general type in which the Proceedings are printed.]

"Probably no Science has made more rapid advances the last quarter of a century than that of Geology, and the cultivation of it as regards the industrial pursuits of a Country, is calculated to produce more wealth, power, and independence for its people, than any other Science with which we are acquainted.

If it be admitted (which I believe it is) that the source of England's greatness is to be attributed principally to her Coal and Iron, then Geology must be admitted to have played no unimportant part in the discovery and development of her great mineral treasures. Indeed it is solely upon Geological and Mineralogical explorations and deductions that the Mineral riches of any country can be brought to light.

Beyond the interest with which Geology is associated from an industrial point of view, it has its Palæontological and Lithological wonders to gratify and elevate the mind of the reflective man.

The boundless myriads of fossil remains, both of animal and vegetable origin, from the microscopic Animalcule to the gigantic Megatherium, and from the microscopic Fucus to the gigantic Endogenous and Exogenous plants, as discovered in the crust of our earth,—preserved as they have been through countless ages, cannot but strike the mind of the Geological student as one grand colossal and faithful record of the past ages of our globe, and prove to him a study of the highest and most interesting order.

The province of this Paper, however, is more particularly to draw the attention of the members of this Society to the Physical Geology of the confines of the South Staffordshire Coalfield, with a view, if possible, of making further discoveries of Coal, and increasing the size and importance of the district.

The Coal-field, as now explored, measures from South to North, say from Cradley to Brereton, near Rugeley, a distance of 20 miles, and from East to West, from Westbromwich to Kingswinford, a

distance of 7 miles. This area then which amounts to about 80 square miles, as at present explored, represents the *total area* of coal bearing rocks for all the purposes of the immense mining and manufacturing interests of the district, and nearly the whole of that famous seam of thick or 10 yards coal is exhausted.

It has been estimated by Mr. Wm. Matthews,* that the duration of the Thick Coal at its present rate of consumption (unless further discoveries are made) will not exceed 42 years on the East side of Dudley, and 37 years on the West side of Dudley. Whether this assumption—based as it is no doubt upon the most practical and correct data which that gentleman could collect, is quite true, or even an approximation to the truth, it becomes a matter of the most serious contemplation to the interests of this busy hive of industry.

What can the immense manufacturing interests of the district do without a supply of coal ?†

The present consumption of Ironstone is more than the district can produce,—hence the resort to other districts for a supply, and should the demand for Coal also exceed the means of production, the manufacturing establishments must leave the district altogether.

Mr. Hunt, keeper of mining records connected with the Government School of Mines in Jermyn Street, estimates that in the year 1861, 83,635,214 tons of Coal were raised in the United Kingdom from 3052 Colliers, divided as follows:—

	Number of Colliers.	Tons.
Durham and Northumberland	217	19,144,965
Cumberland	28	1,255,544
Yorkshire	397	9,374,600
Derbyshire and Nottinghamshire	180	6,116,319
Leicestershire	11	740,000
Warwickshire	16	648,000
Staffordshire & Worcestershire	580	7,253,750
Lancashire	370	12,195,500
Cheshire	39	810,570
Shropshire	66	829,750

* On the 10 yard Coal of South Staffordshire, read before the Institute of Mechanical Engineers, at Birmingham, on the 8th of August, 1860.

† In 1858 Mr. Hunt gives the number of Blast Furnaces in the South Staffordshire district as 182 in Blast, and 147 out of Blast, making a total of 329, and the number of Puddling Furnaces as 1945.

Gloucestershire, Somersetshire, and

Devonshire	...	...	...	112	...	6,514,025
Wales	...	...	...	391	...	8,561,021
Scotland	...	...	...	424	...	11,081,000
Ireland	...	...	...	46	...	123,070

Out of the 83,635,214 tons raised in 1861, 75,708,589 tons were consumed at home, and 7,926,625 tons were exported.

The great rate of exhaustion that is yearly going on in this very limited Coalfield, viz., to the extent of 7,253,750 tons per annum, shows the importance of further discoveries of Coal being made if possible, and it is only by the solving of some Geological problems that we can hope to effect this desideratum.

By referring to the admirable Ordnance Geological Map of this Coal-field, by J. Beete Jukes, Esq., it will be seen that it is bounded in some parts by the New Red Sandstone, but principally by the Permian Rocks. In some cases the Permian lying against the up-lifted edges of the Coal measures, and in others overlying the denuded Coal measures.

At West Bromwich a large area of valuable Thick Coal below the Permian has for many years been in successful operation at a depth ranging from 250 to 400 yards. The spirited undertaking of the Earl of Dartmouth at the Heath Pits, West Bromwich, was the first in this district to unravel the mystery of the existence of the Thick Coal underneath the Permian. This took place in 1832, at a cost of nearly £30,000. Since then many more extensive sinkings have been prosecuted to the same Bed, and with the same successful results, but at considerably less cost and trouble on account of the experience gained and from improved mining appliances.

The district here referred to lies between the following four points.—The Junction Inn, West Bromwich; the New Workhouse at West Bromwich; Messrs. Chance's Glass Works, at Spon Lane; and Broadwell Colliery, near the Oldbury Carriage Works.

It is here worthy of remark, that at Messrs. Chance's Glass Works the Thick Coal lies at a depth of 400 yards, is of its regular character and thickness and no appearance of any fault in the direction of Smethwick or Birmingham, and having a slight South Easterly dip.

This being the case may we not fairly calculate upon the seam continuing not only in a direction for Birmingham but in a direction taking in the ground between Oldbury and Smethwick on to Warley Abbey, and thence into the little peninsular of coal measures that jut out from the main body of the Coal-field at Weoley Castle near Harborne, which would give an area of about 6 square miles.

From the fact of the Thick Coal existing beneath the Permian rocks in one place it is only reasonable to expect it to exist under the Permians in another, supposing the Geological conditions are in every way analogous.

Again on looking to the South end of the Coal-field there will be seen a vast extent of Permians overlying the Coal measures, equal to about 15 square miles *with the Coal measures South of it cropping out against the Lickey Hill.*

A good rib of Thick Coal running East and West has been cut off, extending from the Hayes Colliery, near the Lye Waste, where it is 130 yards deep, passing Cradley, nearly to the town of Hales Owen, where it is 250 yards deep, and having a slight South Easterly dip towards the Permians last referred to, without any indications of any fault or other disturbance to cut it off.

Beyond this evidence, as to the existence of Thick Coal in that direction, Major Richards has recently bored at Wassel Grove, and there found the Thick Coal at a depth of 175 yards (525 feet.) The Thick Coal discovered by such boring, including the partings, being upwards of 30 feet in thickness.

Taking then the length of the rib actually cut off by the different Collieries now at work on the line of it as $2\frac{1}{2}$ miles, and the distance of the bore hole south of the rib cut off at $1\frac{1}{2}$ miles, we have in this instance nearly 2000 acres that may be fairly calculated upon.

South of this 2000 acres is another 2000 acres of Coal measures exposed at surface, which appears equally favorable, and South of this is the 15 square miles of Permians before referred to, with the small patch of Coal measures rising to the surface still South of the Permians that may also be fairly calculated upon so long as there are no indications to the contrary.

With such very favorable evidence as to the probable extension

of the Coal-field in the latter direction, it is almost incredible that no capitalist or large landed proprietor has at present been found who would incur the cost of sinking a proper shaft; but this has possibly been caused to some extent by Mr. Jukes stating in his first memoir of this Coal-field that he estimated the depth at Wassel Grove to be 1,000 feet, or 333 yards. Whereas in reality it has proved to be 525 feet only, or a very little more than one half of the estimated depth.

I do not mention this in any way to disparage the labours of Mr. Jukes, on the contrary, I believe his efforts for the interests of this district to have been of the very highest character, and I have often felt grateful to both him and his colleagues for the kind and valuable information they have at all times lent me when solicited.

Besides the two outlying unexplored districts before alluded to, there are Permians extending from Himley to near Cannock, a distance of 9 miles, under which there is a great probability of the existence of Coal; but I refrain from a more detailed reference to this portion as it would encroach upon the valuable paper which is hereafter to be read by Mr. S. H. Blackwell, upon the probable connection of the South Staffordshire Coal-field with that of Shropshire.

The study of the probable connection of the South Staffordshire and Shropshire Coal-fields would be vastly assisted by members being particular in properly labelling all fossils collected in either Coal-field, in order to determine their respective analogies, and thereby probably the relative beds of Coal or Ironstone in either district.

Whilst upon the subject of a comparison of the fossil remains of different Coal-fields, I think I cannot do better than add a very interesting and valuable extract from a paper "On the Fossils of the South Wales Coalfield," by J. W. Salter, Esq., page 219, wherein he says:—

"We know less, perhaps, of the succession of Coal Strata than of any other in the United Kingdom, though they are the most important of all. Nearly every bed of the Oolites and even of the older Palæozoic Rocks has had its place determined and its organic contents are more or less known. But our hundred Coal and Ironstone beds have hitherto been treated as a whole (they form a mass 4000 to 12,000 feet in thickness) and the succession,

"mineral aspect, &c., of these beds have yet been traced only for each separate locality; the data, in many cases supplied by practical miners, being registered on our maps.

"The comparison, therefore, even of neighbouring Coal-fields is not yet made, yet this should have a high scientific value, if not a practical use. * * * In every other thick formation it has been found possible to ascertain the horizon with tolerable certainty by the aid of fossils. It is hoped therefore, by the help of such Coal proprietors, Ironmasters, and Mining Engineers as will take the pains to collect *accurately*, that we may be able to offer them useful information."

Mr. Rogers has also added in his Iron Ores of South Wales, page 182—

"The subject of perhaps most interest is the plainer elucidation of the variety of species of Organic remains in the different beds of Iron Ore. Already this seems to enable us to some extent to connect Palæontologically iron stone measures in other Coal-fields with those of this district. We may also hope to follow the like course of investigation at some future time with the Coal measures."

After having called your attention to the very important unexplored portions of our Coal-field, and believing as I do that the success of such an Institution as this mainly depends upon the amount of practical good it can afford to the interests of the district in which it is founded; I respectfully suggest to the Committee that its first and primary efforts should be expended at home, in endeavouring, if possible, to collect such an amount of practical evidence in favor of the extension of the Coal-field, that if successfully carried out, would obtain for the Institute such an amount of patronage and support as would ensure its beneficial and permanent existence.

No doubt excursions during the ensuing summer to Matlock, Droitwich, Malvern, and other equally interesting localities, would be hailed with joy by many of us, but as Dudley has been proposed as a centre of operations, and as I do not believe that the greatest amount of good results from the greatest distance scampered over in a day's excursion, I would suggest that the Society thoroughly explores its own Coal-field before extending its operations abroad.

Amongst the topics for the future discussion by the Society,

which if impassionately conducted, may prove of the greatest importance to the interests of the district,—I will mention the desirability of endeavouring to establish a connection between the Thick Coal where last seen at Spon Lane, West Bromwich, at a depth of 400 yards, and the outcrop of a Coal of similar thickness (10 yards) at the Hawkesbury Colliery, near Coventry. And as the shallow and deep Coals of Cannock Chase are so analogous to the deep and Bench Coal at Tamworth, whether a connection between these two districts cannot be satisfactorily established in addition to an examination of the Permian district lying between the South Staffordshire and the Shropshire Coal-field.

Mr. Jukes in his valuable and interesting memoir of the South Staffordshire Coalfield,—presuming upon a certain thickness of New Red and Permian rocks existing between this Coal-field and that of Warwickshire and Shropshire, states that it may *probably* be 1000 yards deep to the Coal in each case, and I have shown in the previous part of this Paper it may with equal probability be only half that depth, and thereby bring these two immense tracts easily within the reach of improved modern Mining machinery. Almost within my own business recollections it was a great question *where* Coal *existed*; but from the rapid stride which Geological Science has taken of late years, it is now the more difficult under certain Geological conditions, to say where it does *not* exist. As for instance, where the Permians exist, and other Geological indications favorable, it may be regarded as indicative of Coal rather than the contrary.

Some years ago a notion was entertained that no coal would be found under any Red Sandstone or purple Marls, or in the proximity of domes of Basalt. Geology and practical mining have together proved the utter fallacy of such conclusions. In this Coal-field the Thick Coal has been found and worked to the extent of nearly half-a-mile, under where the Rowley Rag (Basalt) shows itself at surface—has been wholly worked under Pouk Hill, (Basalt) near Walsall, without being cut out by such Basalt, and the Thick Coal has been found to exist under the Permians wherever it has been properly sought after.

Instances all over the Kingdom may be given of the explosion of the fallacy above referred to. For instance Munkwearmouth

Colliery, Sunderland, after sinking through the New Red Sandstone, Magnesium Limestone, (104 yards thick,) and Permian Sandstone came down upon valuable beds of Coal,—the lowest seam (4 feet thick,) at a depth of nearly 600 yards. The extent to be wrought by this is 4000 wining acres,—a great portion of which lies under the German Ocean, at a still greater depth. This Colliery has raised as much as 1,700 tons in one day, and its average winter production is nearly 7000 tons per week!!

Another prominent case in point are the deep pits at Dunkensfield, which passed through the New Red and Permian rocks, and reached the lowest bed of Coal (4 feet 8 inches thick,) at a depth of nearly 700 yards, and is now raising nearly 3000 tons per week. The Coal dips at the rate of 2 feet in a yard for 1000 yards, which makes a total depth where the coal is now being got of nearly 1,400 yards from the surface!! The extent of this Colliery is about 1,300 acres.

The Snibston and other large Leicestershire Collieries are perhaps as singularly situated. There below the New Red and Permian rocks, and in close proximity to the great Cambrian and Syenitic upheaval of Charnwood Forest, some of the finest Coal in the Midland Counties is being very extensively raised.

Many similar, and probably more spirited undertakings may be enumerated, but sufficient I hope has been said to show that great depths and apparent Geological uncertainties, and mining difficulties are overcome by the modern appliances of mining, the introduction of Capital, and the application of sound practical judgment.

I feel I have already extended my observations to a greater length than was originally intended, but I cannot conclude without wishing that every Mine Agent of the district may become a member of this Institute. That a general Geological plan of the entire district *upon a large scale* may be provided when the New Rooms are completed, upon which the Faults, Outcrops, and other interesting data relating to the Coal-field may be by us correctly recorded from time to time, and thus enable us to hand down to successive generations some guide as to the extent of our operations, and thus show that we during our time were not unmindful of both the pleasures and troubles that awaited our mining successors."

A short discussion took place after the reading of this useful paper.

The last Paper read was by Mr. Jones, and was devoted to a description of the Geological features of the various localities which the Society proposed to visit during the summer months. The subject matter of the Paper will be found in the accounts of the several Field Meetings.

The first Field Meeting for the season was held at the Lickey Hills near Bromsgrove, on which occasion the following Members were present:—Rev. J. H. Thompson, Miss Beckett, Messrs. Beckett, H. H. Beckett, Fraser, W. H. King, (and friend), F. Fellows, S. Allport, J. Solly, J. Hough, C. Ketley, E. J. Hollier, J. Hamp, W. Cooper, T. Heming, (and friend), F. Simpson, J. Whitley, H. Peacock, J. Lees, E. Hollier and Jones.—The day threatened to be an unfavourable one, and hence many were prevented from taking part in the excursion; Rev. J. H. Thompson and Mr. T. Heming, kindly undertook the guidance of the party, and the former gentleman, by means of diagrams and maps, gave frequent explanations of the peculiar Geological features of the district. After leaving the Barnt Green Station, the party proceeded to Kendal End, where a small patch of Limestone is exposed beside the road; they next passed through the wooded ground on the south side of the hills, and here several sections of the altered Llandovery rocks were examined. The range of hills extending from Kendal End, in a direction almost due north, to Priest's Wood, a distance of two and a half miles, is composed of several rounded, heath-clad, barren eminences, separated on each side by lines of fault from the adjoining beds of Keuper Sandstone on the east, and Permians on the West. The May Hill Sandstone or upper Llandovery of nearly the entire range has been changed into a highly quartzose rock, either by the action of internal heat, or, according to some authorities, by the infiltration of hot springs charged with siliceous matter. In places, however, the beds have escaped alteration, and there they are composed of a coarse gritstone, containing numerous casts of the characteristic fossils of this formation, as developed in the West of England. The layers, wherever exposed, are found to be inclined at a high angle, and are frequently very much broken up and contorted, as if they had been subjected to a powerful lateral force as well as to one acting from beneath. The best sections are exhibited in the deep pass immediately below the Old Rose and Crown, and in a large quarry on the eastern side of the southern end of the range. To the east of Rubery Hill the Wenlock Shale occurs, and in a field adjoining Long Wood several slabs of fossiliferous limestone were obtained. It is difficult to determine the exact character of these beds, but the probability is that they belong to the lower part of the Wenlock series, and are the equivalents of the Barr Limestone of the Walsall district. A small patch of Coal measures occurs both east and west of this hill; but though some years ago, sinkings were made in search of Coal, no workable seams were found. The Permians appear to rest conformably on these Coal measures, so that it is not unlikely that they are connected with the Halesowen part of the Staffordshire Coal-field. A bed of true Coal was noticed on the banks of a little stream which skirts Balaam's Wood. During the ramble the botanical members of the party managed to secure upwards of sixty different plants in flower, including the *Hesperis matronalis* or Dame's Violet, the Geum Rivale (water

Avens), *Narcissus pseudo narcissus* (common Daffodil, in great abundance near Rubery Hill),—the *Viola palustris*, which grows in this district was not obtained. At 3 o'clock the party dined at the Rose and Crown, and after a vote of thanks to the Rev. J. H. Thompson and Mr. Heming for their able assistance during the day, the proceedings terminated.

On May 9th, A Committee Meeting was held at Dudley, Rev. H. B. Bowlby in the Chair; present, Revs. J. H. Thompson, J. W. Bain, Messrs. Beckett, Frazer, Capewell, Stokes, Wright, and the Secretaries.

The following were elected Members:—Right Hon. Earl Dudley, Ralph Brown, J. Marshall, Dr. Brigstocke, W. Lea, junior, J. Lea, junior, Rev. Geo. Dalton, J. Haines, D. Peacock, Rev. J. H. Huntsman, H. M. Mainwright, J. N. Bagnall, Geo. Hodson, J. Solly, Wilson Lloyd, Wm. Davis, S. Powell, junior, Geo. Thompson, W. Davies, Martin Wilkes, Elisha Mander, and Rev. J. Whiteley.

Arrangements were made for the Annual Meeting in Whitsun-week.

Messrs. Wright and Stokes were appointed Auditors to examine the Accounts for the past year.

On May 27th, A Committee Meeting was held at Dudley, prior to the General Meeting,—Mr. H. Beckett, in the Chair; present, Revs. J. W. Bain, and Dr. Gordon, Messrs. Frazer, Capewell, Stokes, Wright and the Secretaries.

The following were elected Members:—Right Hon. Earl of Lichfield, C. Foster, Esq., M.P., H. F. Vernon, Esq., M.P., H. B. Sheridan, Esq., M.P., Rev. T. L. Claughton, W. H. Haden, C. J. Turner, E. B. Turner, W. Madeley, F. W. North, T. Cooper, T. Hill Round, E. Terry, junior, W. C. Bourne, R. C. Jobson, B. P. Walker, — Piggott, Miss Totty, John Piggott, E. W. Bernard, Professor Anderson, Daniel Rogers, G. Hooper, S. Bailey, T. Spruce, S. Spruce, Rev. T. Boxer, Mrs. C. J. Phillips, Thomas Crewe, Wm. Crewe, Alfred Bowkley, Fred. North, Thomas Wood, W. Barnett, Alfred Colbourn, Rev. Canon Moore, Rev. T. Longman, Rev. J. Mac Gahren.

The First Annual General Meeting of Members was held in the Assembly Rooms, Dudley Arms Hotel, May 27th, 1863.—H. Beckett, Esq., in the absence of S. H. Blackwell, Esq., presiding.

The following Members (as taken from the list of signatures in the book placed for that purpose at the entrance), attended:—H. Beckett, Dr. Frazer, T. Wright, Miss Beckett, E. Hollier, Jno. Jones, (Hon. Secs.,) L. P. Capewell, Rev. J. Whiteley, Rev. M. Gibson, L. Chappelle, J. Lindop, J. Ronaldson, Rev. Dr. Gordon, J. W. Newman, Chas. Gray, J. Piggott, J. R. Veall, W. Griffin, Ab. Milward, F. W. North, Thos. Roper, J. Bowen, J. W. Baker, E. Grainger, W. H. Laxton, C. Sturtevant, E. Terry, J. T. Hatton, J. Cooksey, John H. Cooksey, Miss Cooksey, T. Powell, C. J. Phillips, J. J. Shedden, H. Brigstocke, Ed. Robinson, J. Bateman, A. A. De Lessert, H. Johnson, S. Bowkley, S. Bailey, T. Brettell, J. Hamp, W. Cooper, J. Hough, Rev. T. Slater, E. J. Hollier, D. Lees, Rev. J. Boxer, J. U. Fellows, W. Made-

ley, Rev. G. Lewis, Rev. J. W. Bain, Rev. W. Auden, J. Ketley, H. C. Roper, A. Thompson, H. Burton, J. Westley, J. H. Lloyd, Geo. Hodson, Geo. Taylor, H. Biden, C. Manby, W. H. Haden, J. Manby, Rev. Geo. Dalton, J. Rabone, W. Farnworth, Dr. Wollaston, M. Bigge, Geo. Thompson, W. H. Duignan, W. Newman, Chas. Britten, S. Allport, A. W. Wills, C. A. Thompson, Miss Totty, M. Wilkes.

THE ANNUAL REPORT was read by Mr. Jones: the following is an Abstract:—

“The Committee of the DUDLEY AND MIDLAND GEOLOGICAL SOCIETY have great pleasure in presenting this, their First Annual Report, and in being able to congratulate the Members on the great success which has attended their attempt to re-establish a Geological Society in a district having such peculiarly interesting scientific and antiquarian associations as the neighbourhood of Dudley possesses. Their success has indeed far exceeded their most sanguine expectations; and though when the promoters of the movement ventured on their first appeal they met with but little encouragement from some to whom they looked for support, the warmth with which others responded, more than compensated for their trifling discouragement. The object of the promoters was to establish a Scientific Society for Dudley and South Staffordshire, which should combine the main features of one formerly existing in this district, with the objects contemplated by such associations as under the name of Field Clubs and Naturalists' Associations, have done so much to promote the pursuit of Geology and kindred sciences. It was proposed that the work of the Society should consist of field days for the purpose of examining the interesting localities in or near the South Staffordshire Coal-field, of social gatherings in various places when Papers on Scientific subjects should be read and discussed, and of exhibitions of Fossils and Geological specimens from time to time; and the Committee hope to shew that they have not only adhered to the principles on which they had to be guided, but have been able to accomplish much more than at that time they anticipated they should be able to do. Lord Lyttelton, with his usual willingness to render a public service, most kindly consented to become President of the Society; it was welcomed by kindred Associations in the Midland Counties, and before the inaugural meeting it was affiliated to the principal Field Clubs in the Midland Counties. A very extensive canvass was made of the whole district, and its proposed operations were brought under the notice of all the leading gentry of the locality, and also of those practically engaged in mining. The result has been that a continual stream of members has flowed in, nor has it at present shewn any signs of being on the decrease. The ambition of last August was to see 200 members on the list, the ambition of to-day is that double that number will shortly fill its ranks. The Committee point with pride to the fact that the Society now consists of about 350 ordinary subscribing members, including a large proportion of Ladies. The following Noblemen and Gentlemen, the majority of whom were patrons of the old society, have recently become patrons of the present Society:

The Earl of Dudley.

The Earl of Lichfield.

Lord Lyttelton.

Sir Roderick Murchison, D.C.L., F.R.S., F.G.S., L.L.D., Director General of the Geological Survey.

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 *Patskull*, 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.

tion have accepted the Society's invitation to be present, and are going to spend two days in the district, and the Committee hope that the welcome which they will receive may leave in the minds of their visitors not only a full appreciation of the scientific features of the locality, but also a recollection of kindly fellow-feeling to brother explorers in Nature's fair field, which, despite the physically black exterior of our landscape, is most sincerely felt by the members of this society. Each member has this day to act the part of a host, and it is hoped the guests will be well entertained. Again the Committee have to thank the Earl of Dudley for illuminating the Caverns, and Richard Smith, Esq., for the privilege of inspecting the Priory Ruins, and for making the general arrangements for this Evening's entertainment; their thanks are also due to S. H. Blackwell, Esq., for consenting to deliver the Annual Address which is to bind the New Society to the Old, and direct its members to follow those useful labours which marked the existence of the parent Society, and also to the same gentleman for the experiments in Iron Making which are in store for us; to Frederick Smith, Esq., who has arranged a Subterranean Excursion for the London Geologists tomorrow, and to other kind friends who have in various ways contributed to make this day a pleasant gathering.

But the Committee are not only able to look with satisfaction to the results of the past year's operations;—they can look with even more pleasure on the prospects of another season. The Field Meetings for the Summer include visits to Malvern, Matlock, Stiper Stones, and Wenlock; in each of which places, in addition to the prospects of a day's pleasant re-union, there is reason to believe that the student of natural history generally, or geology and botany in particular will find ample scope for his favorite pursuit. Papers have been promised on the connection between the South Staffordshire and the Shropshire Coal-fields; on the extinct Volcanoes of France; on Iron Ores; and on Botany. The Committee hope to be able to invite the members to an Evening Meeting during the summer, when some of these Papers may be read and discussed. Members who are desirous of reading Papers to the Society are requested to communicate with the Committee: it must, however, be understood that such Papers will be looked upon as the property of the Society.

The Mechanics' Institution Building will be completed by the beginning of October, when a Bazaar in Aid of the Funds will be held, and your Committee hope they may be able to co-operate by arranging another Scientific Exhibition, which may remain open for a longer time than the last. The Museum will be fitted up and opened as soon after as practicable, in the meantime, donations of scientific books, diagrams, models, or fossils for the Museum will be gladly received. The Committee have also been promised by Mr. Hartland a beautiful fossil tree which has been recently discovered, and they hope it may form one of the most prominent features in their collection; they may have the tree for the mere expense of removal, and the members will be asked to vote the necessary funds for the purpose. J. W. Salter, Esq., in addition to coming expressly from London to take part in this day's proceedings, has also promised to deliver a Lecture on the "Order of Creation," and which the Committee trust they may be able to offer sometime in July.

The Secretaries have been in correspondence with the Miners' Association of

Cornwall and with similar Societies in other parts of the kingdom, with the view of drawing up a scheme for the consideration of this meeting, but they have not been able to put the results of that correspondence in form at present. It is the desire of the Committee, however, to give full attention to any well considered plan for making the Society practically useful to the district, though it is scarcely to be expected that with the present rate of subscriptions very much extension of its operations can be looked for. Robert Hunt, Esq., London, and Lionel Brough, Esq., Bristol, have, in particular, promised their assistance in arranging a department for practical science, suitable to the industry of this locality.

Mr. Beckett has kindly consented to deliver one or more Lectures to the Working Miners in some central place, and other gentlemen have been communicated with and asked to take part in a series. The Committee entertain little doubt but they shall be able to carry this scheme into effect next winter.

Such is the account which your Committee have to give of their labours, and of the gratifying position to which the Society has now attained; and have not the anticipations with which they ventured to set out been more than realized? That there should be some short-comings here and there is only natural, especially when the rapid growth of the Society is taken into consideration; but the Committee feel confident that the members will be disposed to look rather at what has been accomplished than to criticise too severely what may inadvertently have been left undone. Their account is a long one; but in closing it they would express the great pleasure which the past year's work has given them, and they would particularly mention the kind assistance which they have received from all quarters in carrying out the objects of the Society. That the future career of the Dudley and Midland Geological and Scientific Society, may be as bright as its present prospects seem to imply; that each year fresh workers may join its ranks, and contribute to its efficiency; that a spirit of liberal feeling and brotherhood may be maintained between its members; that its pleasant Field days may long afford its members the opportunity of working together in their respective walks of science, and that standing which the Scientific Societies have given to this Club may be justified by future results, are the wishes with which your Committee conclude their report; and they would only add their hope that the transactions of this long and varied day, may not be among the least interesting gatherings of the Dudley Geological Society."

The Report was adopted, after which the following Financial Statements were submitted, and passed. The Secretaries explained that owing to inadvertence the financial year had been made to terminate at the end, instead of at the beginning of May, and hence that all the subscriptions were not then paid up. They presented therefore a statement of actual receipts and expenditure, and another detailing the arrears of subscriptions and the liabilities of the Society:—

FINANCIAL STATEMENT TO 27TH MAY, 1863.

Dr.	Receipts.			Disbursements.		Cr.	
		£.	s. d.	£.	s. d.	£.	s. d.
Subscriptions,—175 Members	...	43	15 0	Preliminary Expenses	...	1	5 3
Cash at Evening Meeting, March 17th	...	0	17 0	Printing and Bill Posting	...	9	13 6
Due to Secretaries	...	1	8 8	Advertising	...	1	18 0
				Postage and Carriage of Parcels	...	13	16 6
				Stationery, (including Cards for 2 years)	...	6	4 8
				Card Plate, Press and Die	...	5	10 0
				Expenses of Inaugural and Field Meetings	...	1	16 0
				Reporters' Expenses	...	0	15 8
				Hire of Room for Evening Meeting	...	1	1 0
				Travelling Expenses of Secretaries	...	4	0 1
						£46	0 8

THOS. WRIGHT, }
JOS. STOKES, } Auditors.

ACCOUNT OF ARREARS AND LIABILITIES OF THE SOCIETY.

Dr.	Arrears, &c.			Liabilities.			Cr.
		£.	s. d.		£.	s. d.	
To Arrears of Subscriptions—				Balance due to Secretaries	...	...	...
Total number of Members for past Year	...	305		Accounts not Received—	...	...	...
Less Paid	...	175		Printing, including Transactions, No. 1	11	0 0	0
				Advertising	...	...	...
				Sundries	...	...	...
Estimated at	...	120	30 0 0	Expenses of Annual Meeting	...	...	...
Cards in Stock	...	...	2 0 0	Balance in favour of the Society	...	...	...
					11	0 0	0
					£32	0 0	0

It was unanimously resolved,—That the best thanks of the Society be given to the Right Hon. Lord Lyttelton for his services as President during the past year.

Also, to the Right Hon. The Earl of Dudley for his kindness in illuminating the Caverns at the meetings of the Society, and for the privileges which he has been pleased to grant to the Members.

Also, to R. Smith, Esq., S. H. Blackwell, Esq., F. Smith, Esq., Professor Tennant, H. Beckett, Esq., and Edward Hull, Esq., for their services to the Society, particularly in connection with the present Annual Meeting.

Also to the Exhibitors who kindly sent Specimens and Scientific Apparatus, &c., to the Conversazione in November last.

The Right Honorable Lord Lyttelton was re-elected President for the ensuing year.

The Vice-Presidents were re-elected, and J. P. Baker, Esq., Inspector of Mines, and Rupert Kettle, Esq., were added to the number.

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

Allport, S., Birmingham.
 Bain, Rev. J. W., Bilston.
 Bailey, S., Walsall.
 Bigge, M., Wolverhampton.
 Bowly, Rev. H. B., Oldbury.
 Capewell, L. P., Dudley.
 Cooksey, Joseph, West Bromwich
 Frazer, J., M.A., M.D., Wolverhampton.
 Grier, Rev. J. W., Amblecote.
 Gordon, Rev. Dr., Walsall.

Hough, J., Wrottesley.
 Ketley, Charles, Dudley.
 Lloyd, Sampson Z., Wednesbury.
 Newman, J. W., Walsall.
 Puddicombe, A., Wolverhampton.
 Solly, N. N., Bushbury.
 Stokes, Joseph, Dudley.
 Thompson, Rev. J. H., Cradley.
 Walker, B., Wolverhampton.
 Wright, T., Dudley.

Mr. Edward Grainger, was re-elected Treasurer; and Messrs. Hollier and Jones, Hon. Secretaries.

It was resolved,—That the best thanks of the Meeting be given to the Honorary Secretaries for their services during the year. The Secretaries duly acknowledged the compliment.

After a cordial vote of thanks to the Chairman, H. Beckett, Esq., the business proceedings terminated.

The Members and friends of the Society, together with a party from the Geologists' Association, including the President, Professor Tennant, London, and representatives from the Woolhope, and Malvern Field Clubs, next proceeded on an excursion, under the guidance of Mr. Beckett. They first visited the New Building in course of erection for the purposes of the Dudley Mechanics' Institute and Geological Museum. The Building was much admired, and the arrangements for the Museum appeared to meet with general approval. It was stated that the whole erection would be completed by the end of the summer. The Excursionists then set out for the Wren's Nest Hill, which from its peculiar geological features, and the rich stores of organic remains which it contains, is a most interesting place.—The steep and bare escarpment on the south and west, laid bare by the

workings for the Thin Limestone, were first examined; the party next went to the excavations about the middle of the Hill, where several faults intersect each other, and where most instructive sections are presented to view. The general structure of this hill corresponds with that of the Castle Hill adjoining, particulars of which were given at the Evening Meeting of Members in March last. A torch-light procession was formed at the northern entrance to the subterraneous workings, and the whole party passed slowly through the vast galleries, which were beautifully illuminated on the occasion with coloured fires.

Shortly after Three o'clock the whole party, with numerous augmentations in the shape of late arrivals, sat down to luncheon at the Assembly Rooms, the Chair being occupied by H. Beckett, Esq., and the Vice-Chair, by Professor Tennant. About 140 members and friends were present.

Immediately after Luncheon S. H. Blackwell, Esq., F.G.S., delivered an elaborate and comprehensive address, embracing the principal facts of Geological interest and discovery, which have occupied the attention of scientific men for the last quarter of a century. As it has been found impracticable, to include this valuable address in the present proceedings, without deferring the issue of the same for a longer period than is considered desirable; it has been decided to print the Address separately, and to circulate it as soon as possible.

Professor Tennant, (King's College, London, and President of the Geologists' Association,) next gave an interesting address on the connection between Mineralogy and Geology, which he illustrated by numerous diagrams and specimens of minerals, many of great rarity. As the time for proceeding to the Caverns had nearly expired, this useful lecture had to be curtailed, but the committee have been favoured with a promise from Professor Tennant to embody his remarks in a paper which will be printed in some future proceedings.

The following paper by Edward Hull, Esq., B.A., F.G.S., of the Geological Survey, entitled "A brief sketch of the Triassic Group of central England; with special reference to its usefulness as a source of water supply," was presented, as read by Professor Beckett.

The Trias or New Red Sandstone must ever form a subject of interesting research to the inhabitants of the central Counties. Hitherto indeed, it has been regarded rather as a sandy desert, a *terra incognita*, or dreary waste; separating the fruitful regions of the Lias on the one hand, from those of the Coal Measures on the other. The times of this ignorance are, let us hope, passing away: for, although nature has left but few footprints on the sands of time, in the shape of fossil remains, belonging either to the animal or vegetable kingdoms; yet, I venture to say, whoever investigates the structure, arrangement, and position of these "Red rocks," with reference to those on which they repose,—whoever traces out their lines of fracture,—follows their old sea beaches, and

watches their ever-varying features, as he traces them from district to district, cannot fail to derive pleasure and receive instruction, on the subject of the Physical Geology of bye-gone ages. Nor let us forget the beautiful and varied scenery with which the Trias presents us. Where shall we find a district affording a more marked and peculiar aspect than the valley of the Churnet at Alton, with its deep, richly wooded dells, surmounted by escarpments of white Conglomerate,—often repeated several times in succession, by the agency of Faults; and offering numberless choice scenes for the pencil of the artist? Or where shall we find, (except amongst the Oolites of Gloucester and Somerset, or the Carboniferous Limestones of Derbyshire and South Wales,)—ridges and scarped terraces, so well pronounced as those of the Peckforton and Delamere Hills,—the Park scenery of Hawkstone, and the noble ranges which traverse Salopia by Apley Hall, Bridgnorth, and southward to Kidderminster! We have only to recall these instances of well marked physical features, in order to banish from our minds the inveterate character of tameness which is sometimes ascribed to this formation: and to allow the Triassic group that place in our thoughts and affections, which has hitherto been monopolised by the more obtrusive formations around it.

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 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, there are probably not 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 similar 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.

It is therefore very important that Mineral Surveyors and Mining Geologists, should make themselves thoroughly familiar with the "Red Rocks;" for assuredly the time is coming when the questions relating to

the search for Coal will involve an intimate knowledge of the theories as well as the practice of Geology.

The Triassic Group may be divided into the following stages,—which may be traced over probably the whole of England, wherever the group is fairly represented.

1. *Keuper Series.*

1. Red Marl with thin bands of Sandstone, called Upper Keuper Sandstone, 450 to 2,500 feet.

2. Lower Keuper Sandstone, containing Waterstones in the upper part, 100 to 450 feet.

2. *Muschelkalk, absent.*

3. *Bunter Series.*

1. Upper Mottled Sandstone, 0 to 500 feet.

2. Pebble beds and Conglomerate, 0 to 750 feet.

3. Lower Mottled Sandstone, 0 to 600 feet.

The Red Marl of Cheshire, Stafford, Warwick and other parts of the Midland Counties requires no description here. It is not likely often to happen that this series of strata will be pierced in search of Coal; considering the thickness of the beds which underlie it. Nevertheless it is a remarkable fact, that one of the most successful Mining adventures on record was accomplished by sinking through this formation; and by one of the most remarkable men of this Century. The story of the sinking of the Snibston Colliery, near Ashby-de-la-Zouch, is well known. Mr. George Stephenson having, with his son Robert, (afterwards the celebrated engineer of the Britannia Bridge,) completed the construction of the Leicester and Swannington Railway in 1830,—came to the conclusion that Coal existed under the Snibston Estate;—which lay along the course of this Line, and which was then advertised for sale. This property was only 14 miles from Leicester, a town, which, at that time depended for its Coal supply upon Canal transit from Derbyshire. Having in conjunction with some friends purchased the estate, he commenced a Shaft;—nothing deterred by the Red Strata, which were found 166 feet in thickness. “At this point” (as Mr. Smiles observes) “a more formidable difficulty presented itself,—one which had baffled former sinkers, and deterred them from further operations.” In fact a bed of Greenstone or Trap was reached, resembling in appearance the rock of which the neighbouring ridges of Charnwood Forest is composed: and, as it was well known, that those rocks were of an age much older than that of the Coal, (in fact Cambrian) all further attempts were considered as useless. Stephenson however thought otherwise. Determining to persevere, he pierced the bed of Greenstone,—entered the Coal measures underneath, and ultimately reached the main Coal; from which he was able to supply Leicester, at a saving of nearly £40,000 a year to its inhabitants.

The Lower Keuper Sandstone is perhaps the most interesting member of the Trias. It passes in its upper part into the Red Marl, by the frequent occurrence of beds of Marl. The term “Waterstones” was originally applied to this series by William Smith, and is retained by Geologists on account of the frequency of Springs, which burst forth from

these strata. The lower beds consist of reddish brown, yellow, or white Sandstone, which yield a material more adapted than any other for ornamental building purposes; and of which most of the Churches and ancient buildings in the central Counties are constructed. The quarries best known are those of Storeton Hill, near Birkenhead, Grinshill, near Shrewsbury, Stanton, near Ashbourne, Coton, near Rugeley, with Kingswood, Penkridge, and Brewood, near Wolverhampton.

At the base of the lower Keuper Sandstone we find a remarkable bed of Calcareous Breccia and Conglomerate formed of Palæozoic detritus, and, which has evidently been an old Sea beach. This Breccia,—(which is well shown in the Railway cutting near Stourbridge,) is often very hard; and forms the crown of the escarpments of Runcorn, Frodsham, Peckforton, Grinshill, Alton and Patshull. Thus the junction of the Keuper and Bunter divisions is generally marked by physical features, such as ridges and escarpments. Amongst the chains of hills which I have mentioned, faults ranging parallel to each other are of frequent occurrence. These have the effect of repeating the original escarpment one or more times; and thus we have often presented a group or system of ridges,—with tabulated surfaces and gracefully sloping flanks, forming a class of scenery as beautiful as it is peculiar.

Bunter Sandstone.

The “Muschelkalk” or Calcareous member of the Trias being absent in Britain, the Keuper series rests immediately upon the Bunter. If it be inquired why the Muschelkalk is absent in this country, there can only be one satisfactory answer, viz.: that the British area was dry land during that period. In proof of which we may adduce the following considerations.—In the first place, there is undoubted evidence in Lancashire and Cheshire, that the lower Keuper Sandstone rests *unconformably* on the Bunter Sandstone. The fine Railway section near Ormskirk shows this most distinctly; and several others in the neighbourhood of Liverpool, to which Mr. G. Morton has drawn attention, are equally satisfactory. In the second place, the Keuper Sandstone frequently rests on an eroded surface of the Bunter: of which we have many examples in the North of England. Sometimes several hundred feet of the lower divisions of the Trias have been wasted away, or denuded before the Keuper has been deposited. In the third place, the base of the Keuper series (as already stated) is an old gravel beach, composed of remains of Palæozoic rocks,—such as would be formed on the re-submergence of a tract of Country, like that of England and Wales;—when the hills would come within the action of the breakers, and the fragments thus dislodged would be carried away and spread over the Sea bottom by the tides and currents. From these considerations then, it is plain, that, at the close of the Bunter period, the area of England was elevated into land; and again, at the close of the Muschelkalk period was partially submerged, which submergence progressed throughout the whole of the Keuper and Liassic stages.

The upper member of the Bunter Sandstone, called “Upper mottled Sandstone,” consists of soft bright red fine grained sand, mottled or streaked with white bands, and containing no pebbles. Its thickness near Birmingham, Wolverhampton and Stourbridge is about 450 or 500 feet.

It is used largely for moulding and castings' sand : and there are many fine openings in it on both sides of the Coal-field.

The Pebble Beds, or Conglomerate, which forms the middle member, is the most largely distributed of the three sub-divisions of the Bunter : for, in parts of Leicester and Warwickshires, where the uppermost and lowest members have thinned out, the Conglomerate often remains ; though reduced in thickness. This sub-division consists in the North and West of England of coarse grained, pebbly sandstone of a reddish brown colour, passing in the central Counties into Quartzose Conglomerate. Under this form it occurs on Cannock Chase and Lichfield, around the Lickey, at Bushbury, Wolverhampton and Penn Hill. The Pebbles of Quartz are well rounded or water worn : showing that they have travelled from long,—in fact unknown, distances. Wherever the present rocks may be, from whence these liver coloured quartzites were derived, there can be no question that it was to the Northward of central England. Their source is however still an object for investigation and discovery. The base of the Pebble Beds is frequently a Calcareous Breccia,—forming the summit of that noble escarpment, which stretches from Shiffnal, southward by Apley Terrace, Bridgnorth, and Kinver Edge to the flanks of the Abberley Hills ;—a distance of 25 miles. This Breccia (which is so finely exposed in the road cutting, which crosses the Ridge east of Bridgnorth,) thins out before it reaches the borders of the Coal-field : and it can only be regarded as another old Sea beach, originally formed around the flanks of the Welsh and Salopian Hills.

The Lower Mottled Sandstone is very similar to the upper ; though not quite so soft or fine grained. It contains no pebbles, and is remarkable for the fine examples of oblique lamination or current bedding it presents. This sub-division forms the flanks of the range of hills just named : and is the rock on which the town of Bridgnorth is built. It is sometimes quarried for building : but should never be used in the construction of any building of importance ; as it rapidly yields to the assaults of time and weather. The thickness of the Lower Mottled Sandstone at Bridgnorth is about 600 feet : and this it maintains without much variation, along the Eastern borders of Wales and Salop,—from Kidderminster and Stourbridge to the mouth of the Mersey, at Liverpool. It rapidly thins away toward the East and South ; disappearing almost entirely in Leicester, Warwick, and Staffordshire : in which case the Conglomerate beds form the base of the Triassic group.

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 toward 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.*

Source of Water supply for Towns:

I have now to call your attention to another aspect, under which to regard the New Red Sandstone,—that is, as a source of water supply for Towns, Factories, or Private Dwellings. I suppose there is no formation better adapted for this purpose; and the failures, which have sometimes attended the sinking of wells in search of water therein are generally to be attributed to the improper selection of sites or positions for the wells, and not to the incapacity of the formation for affording the required supply. To this may be attributed the failure of the well at Wolverhampton, which instead of being sunk on the hill, at the edge of the formation, ought to have been sunk in the plain to the westward;—in the direction toward which the formation dips.

In speaking of the New Red Sandstone as a source of water supply, we, of course omit the upper division of the Red Marl; which is very liable to yield Lime, (as in Worcestershire, Cheshire, and at Rugby and Cheltenham,) through the Lias. The lower division of the Bunter, however is peculiarly adapted for the supply of fresh water. The three members are almost equally porous; and sufficiently uniform to be considered as forming our homogeneous reservoir: often with a depth of many hundred feet, and with an area of supply of several square miles.

The excellence of the Bunter Sandstone as a reservoir for the supply of water depends upon the following qualities;—First its porosity:—on account of this quality, a very large proportion,—often amounting to one half the rain which falls on its surface is absorbed and percolates downward, till it reaches a “Water level.” This water level will depend in given districts, upon the position of the springs, which are the natural sluices; or on the extent of the artificial drain from wells. There can be no doubt, that in the centre of basins, or large areas, a vast quantity of water lies locked up, only waiting to be tapped.

The next quality is its homogeneity, or uniformity of composition. The whole mass of Bunter Sandstone may be considered as uniformly favourable for the purpose of percolation. The general absence of partings of clay, or other impervious strata, allows the rain water which enters the surface to flow pretty freely in every direction. On this account, a well sunk in a proper locality, will draw its supply from an extensive district; and to this, the large quantity of water, which some deep wells afford,—amounting sometimes to one and a half millions of gallons a day, is to be ascribed. There is also this additional advantage, that the supply may be increased by deepening the well, or by boring,—so long as the base of the formation itself is not penetrated. This has been found to be invariably the case in Liverpool.

As regards the quality of the water,—it may be stated that for general purposes it is excellent. For drinking it far exceeds in briskness and

* “On the South Easterly attenuation of the Lower Secondary formations.” Journ. Geol. Soc. Lond. Vol. 16, by the Author.

flavour water drawn from rain or surface drainage. In Manchester, Salford, Stockport and other towns, it is largely employed for bleaching and dyeing. In Liverpool, Birkenhead, and Chester it is used for ordinary household purposes. In general, water from this formation is rather hard, but clear, sparkling, and free from organic impurities. The rock has extraordinary filtering powers; and the water which enters it along the course of brooks or rivers,—or from drainage, charged with matter destructive of life and health is returned,—after undergoing this process of natural filtration, purified and fitted for our use. Under no other hypothesis is it possible to account for the enormous supplies of pure water which this formation supplies in Manchester and elsewhere. I have reason to believe, from the personal admeasurements of a large number of wells in Manchester and Salford, that there are probably as much as six millions of gallons pumped at the bleaching works, factories and breweries, every 24 hours: and considering that this supply is only drawn from a very limited area,—much of which is built over or covered by impervious boulder clay, I am led to believe that the supply is partly drawn from the polluted waters of the Irwell and Medlock rivers; which enter the sides of the rocky channels,—undergo complete filtration in passing through the sandstone, and are pumped from the wells in every way fitted for the purposes required. I therefore cannot but regard the New Red Sandstone as a most valuable group of water bearing strata forming a natural reservoir for the supply of pure water: just as the Carboniferous rocks are distinguished for the supply of Coal. After the many instances I have observed of its capabilities in this respect, I feel great confidence in urging the importance of the subject, in those districts which are either built upon, or are in proximity to the New Red Sandstone: for, while wells in this rock have the advantages of other sources of supply,—they have this superiority over those derived from surface drainage, that the water cannot be contaminated; and that it is less dependent upon seasons of heavy rain-fall, or likely to be sensibly lessened (where the area of supply is large) even in times of prolonged drought.

About six o'clock the party proceeded to inspect the Priory grounds and Ruins, where a considerable time was spent. The Priory appears to have been founded by Gervase Pagnell, (A. D. 1161;) but was built on the site of a small place of worship which had been dedicated to St. James. It was filled with Monks from the Abbey at Wenlock; and in 1190 the Pope confirmed them in their privileges and possessions, including many Churches and Chapels in the neighbourhood. The Barons from the adjoining castle were buried in the convent, and several relics of the dead, in the shape of a stone coffin, and a recumbent figure of a female doubtless of some note, lie uncared for among the ruins. At what period the place was dismantled there are no means of determining; but it is generally thought that it was among the numerous monasteries broken up by order of Henry VIII. In more modern times several dwelling houses

and a mill were erected beside the ruins : but when the present modern mansion was built, what remained of the old Priory was carefully cleared, and now forms a most interesting feature in the topography of the district.

The party next passed on to the Caverns beneath the Castle Hill, which had been beautifully illuminated for the occasion, by the Earl of Dudley. The immense number of lights placed in long rows immediately above the murky water of the stagnant canal, caused a brilliant reflection from the stygian pool, while many of the massive archways were lined with lights, and filled with emblems and mottoes in keeping with the occasion. A band of music performed in the large Cavern, with remarkable effect ; after which J. W. Salter, Esq., gave a brief address on the character of the organisms found in the adjacent rocks, remarking in particular that the Dudley Limestone shales shew evidence of having been formed in deep water far away from land ; hence we may account for the fossils being so well preserved. The upper galleries were then lit up with coloured fires, and the lurid glare of the red flames brought out in a very striking manner the vastness of the roof, with its massive buttresses, succeeding one another till their outline was lost in the dim distance. These Caverns, as affording an opportunity of contemplating the great changes which man can and does bring about, were full of interest to the numerous visitors.

The next point of interest in this long day's proceedings, was Mr. Blackwell's furnaces at Russell's Hall, where, for the special benefit of the visitors from London and elsewhere, the operation of tapping two large furnaces was exhibited, and afterwards a current of air was made to impinge on a mass of molten iron, producing a brilliant shower of sparks and scintillations. An immense crowd collected round the works, and as the light from the iron fell upon the motley groups, the effect was picturesque in the extreme. The visitors appeared particularly interested in these experiments.—By this time, the fireworks in the Castle ruins were ready, and then the proceedings of the day terminated.

On the following morning, about eleven o'clock, a goodly muster of members, together with the representatives of the Geologists' Association, went to inspect one of the Earl of Dudley's thick coal pits, near Pensnett. The machinery and other appliances for working the coal, are here of the most modern construction, and contrast forcibly with the rude arrangements generally adopted in this district. Mr. Spruce, the agent, kindly guided the party. The galleries were well lighted up, and the geologists examined carefully the different matters of interest in various parts, particularly the getting of Coal. Mr. Henry Johnson gave a full description of the Thick Coal, and the method of working it : he also adverted to the dangers to which the men are exposed, to explosions and how they are produced, and to other matters connected with coal mining. A vote of thanks was given to Mr. Johnson for his explanations. The party afterwards inspected an intrusion of Trap Rock in another portion of the workings. After spending about three hours underground, and having

given a vote of thanks to Frederick Smith, Esq., and to Messrs. Spruce and Skidmore, for their explanations, the return journey by Barrow Hill was commenced, and about four o'clock the varied proceedings of the two days' meeting were brought to a close by Dr. Richardson, (Geologists' Association,) proposing a very cordial vote of thanks to the Society for the reception which had been given to the London Geologists. On the same day a small party including Messrs. Salter, Lightbody, and Dr. Griffith, went to Sedgley and the neighbourhood, under the guidance of Mr. Jones, to examine the Ludlow Rocks in that locality.

On Saturday, June 6th, a Committee Meeting was held at the Working Men's College, Wolverhampton: present Revs. H. B. Bowlby and J. W. Bain, Messrs. Beckett, Fraser, Stokes, J. W. Newman, Puddicombe, S. Bailey, J. Cooksey, C. Ketley, J. Hough, L. P. Capewell, and J. Jones, (Sec.)

The following were duly elected members of the Society:—S. Bailey, W. Bromwich, Rev. T. Boxer, Willenhall; T. A. Bailey, Ocker Hill; J. and Henry Cartwright, Dudley; F. H. Fisher, Oak Farm; Jos. Hambleton, London; J. Higham, Wolverhampton; A. Lindop, Bloxwich; J. and J. L. Murcott, Wolverhampton; A. Milner, Bloxwich; C. W. Orford, Liford; J. Rogers, Dudley; Samuel Rudge, Dudley; R. Shaw, Penn-fields; Geo. Shann, Tettenhall; C. J. Turner and E. B. Turner, Dudley; S. Woodhouse, Dudley; Charles Westley, Dudley.

It was resolved that a general circular containing the names of the officers, rules, and general features of the Society's work, should be prepared. Such a circular has since been sent to each member of the Society. It was also resolved to issue the following circular to Mine Proprietors, Mine Agents, and others engaged in practical mining operations in this district:—

"We are requested by the Committee of the above Society to forward you a copy of the Rules, and to invite your attention to its general operations and objects.

The Committee are particularly desirous of making the Society practically useful in developing the mineral riches of the South Staffordshire Coalfield, and in promoting its extension into districts at present regarded as unproductive. These are matters of vital importance to the industry and prosperity of the whole of this populous locality, and there can be no doubt but the careful record and comparison of facts which the progress of mining operations is constantly bringing to light, will prove highly beneficial to the capitalists of the district. The Committee propose then to establish a record office at their head quarters in Dudley, where all such facts may be carefully preserved, and made available for the use of the whole locality. They will provide a map of the coalfield, on a large scale, whereon all new workings, proved modifications of the government survey, &c., may be duly entered, such map being open to general inspection, on certain conditions. They also intend to arrange the fossils of Warwickshire, South Staffordshire, and Shropshire coalfields, in such a way as to show what connection can be traced between those districts. They will

also classify any sections which may be sent to them, with the view of still further correlating the various measures. When, from accumulated evidence, any deductions of importance may be made, such information will be duly published, and made available for the locality. In addition to this, the Committee will be glad to receive communications on any improved mining plans, apparatus, and machinery, which have been introduced into the district; in short, they beg to be favoured with any information which may be likely to prove of practical utility in developing the resources of the coalfield.

Under these circumstances, we solicit your co-operation, particularly in any of the following ways:—

- 1.—Gifts of coal measure fossils, from this or neighbouring coalfields, with particulars of their precise locality, &c.
- 2.—Sections of new workings, especially towards the edge of the coalfield; and plans of worked out mines.
- 3.—Plans, shewing any new faults, &c., that have been proved since the Geological Survey.
- 4.—Papers on subjects of practical interest.

Communications for the Committee should be made to the Secretaries, and as there are frequent meetings of the Executive, all matters relating to this department of the Society's operations, will receive prompt attention."

(This Circular, signed by the Secretaries, has since been extensively circulated.)

It was arranged that Committee Meetings should be held in August, at Walsall; in November, at Westbromwich; in February, at Dudley; and in May at Wolverhampton, on the first Tuesday on each of the above named months.

Mr. Beckett was requested to make the necessary arrangements for securing the fossil tree, kindly given to the Society by Messrs. Hartland and Weston, Dunkirk Colliery.

It was resolved that the preparation of the Transactions be left in the hands of the Secretaries; but that if the publication of all the papers and addresses on hand, should involve too great an outlay, a selection of papers should be published in pamphlet form and be issued to members at cost price.

On Wednesday, June 17th, the Society had the pleasure of welcoming the Cotteswold and Severn Valley Field Clubs, and a complimentary meeting of Members was called to guide the visitors in their excursion round Dudley. Captain Guise, President of the Cotteswold Club, W. Lucy, Esq., Secretary, and C. J. Cooper, Esq., Sec. of Severn Valley Club, brought a party of upwards of twenty, and about a similar number from the Midland Society were present, including Revs. M. Gibson and D. Evans, Messrs. Beckett, Fraser, Hough, Wylie, Macdonald, Whitley, Hodgetts, Johnson, Capewell, Fisher, Ketley, Pigott, Hamp, Cooper, E. Hollier and Jones.

The party proceeded in conveyances to Sedgley, where they commenced an examination of the Aymestry Limestone, which is quarried along the ridge just behind the village to the west. They then passed to the Beacon

quarries, where a considerable time was spent in searching for fossils among the debris from the workings. The following were the most important varieties which were secured, *Encrinurus variolaris*, *Phacops caudatus*, *Orthoceras* sp., **Orthis lunata*, **Lingula Lewisii*, **Rhynchonella nucula*, *Enomphalus sculptus*, **Strophomena depressa*, *filosa*, and *euglypha*, **Rhynchonella Wilsoni*, *Trachyderma squamosa*, *Murchisoni corallii*, **Atrypa reticularis*, and *marginalis*, *Stromatopora*, *Pterinea retroflexa*. Those marked with an asterisk were most abundant. The Aymestry Limestone, the Middle Member of the Ludlow formation, is here a concretionary limestone rather thick bedded towards the base, and is extensively used for burning into 'grey lime'. After passing over the Beacon Hill, the next point of interest was the road cutting at Hurst Hill. where a most instructive section of the Wenlock limestone is exposed, and on one of the faces of rock upwards of forty species of Wenlock fossils were detected. The following is the list, *Stenopora fibrosa*, *Cænites juniperinus*, *P. caudatus*, *S. filosa*, *euglypha*, *depressa*, *A. reticularis*, *marginalis*, *Retzia cuneata*, *Favosites Gothlandica*, *cristata*, *multilopora*, *Glaconome disticha*, *Acroculia*, *Perieochrinus moniliformis*, *R. borealis*, *Salteri*, and *Lewisii*, *Spirifer plicatellus*, *Leptena transversalis*, *Halysites catenulatus*, *Orthis elegantula*, *lunata*, *hybrida*, and *Bouchardi*, *Heliolites megastoma*, *interstinctus*, *Omphyma turbinatum*, *Fenestella* sp. *Stromatopora*, *Pterinea retroflexa*, *Thecia Swindernana*, *Conularia Sowerbyi*, *Cyathophyllum articulatum*, *Chaetetes Fletcheri*, *Petraia bina*, *Cardiola*, *Athyris tumida*, *Enomphalus discors*, and *sculptus*, *Encrinurus variolaris*, *Cyathocrinus* sp. The physical geology of this district is somewhat complicated owing to several faults. The Ludlow beds, however, form a basin, dipping from the centre of the Sedgley valley, which contains a small patch of Coal measures. The Ludlow limestone is faulted against the Ludlow on the Eastern side, the line of fault being well marked by a depression which ranges from near the Fighting Cocks Inn, between Hurst Hill and the Beacon, in the direction of the Wren's Nest, and is possibly a continuance of the North and South fault in the latter place. The Wren's Nest and Castle Hills were visited on the way to Dudley, and after a very pleasant day the party dined at the Hotel, at five o'clock. Captain Guise, the Chairman, proposed a vote of thanks to the Dudley members for the assistance they had given during the day, and after the transaction of some routine business, Mr. Jones, Gloucester, read a very interesting paper on the discovery of some flint instruments found in drift near Stroud. This led to a discussion on the question of the Antiquity of Man, in which Captain Guise, and others took part. The proceedings terminated shortly after seven o'clock.

On Tuesday, June 30th, a Field Meeting was held in the Malvern District, the party proceeding under special arrangements to Ledbury, where they arrived about mid-day. The following were among the members present:—Rev. W. Symonds, Dr. Grindrod, Revs. E. H. L. Noott, and W. Auden, Mr. and Mrs. Beckett, Messrs. J. and J. H. Cooksey, Miss Cookseys and Miss Sylvester, Mr. W. Fleeming and Miss Fleemings, Mr. and Miss R. Brown, Messrs. G. Perry, Fisher, Hardeman, Hamp, Hatton, Wylie, Capewell, Johnson, C. Gray, E. J. Hollier, E. Hollier, Jones, (Secs.), &c. The Rev. W. Symonds, President of the Malvern

Field Club, kindly undertook the guidance of the party, and Dr. Grindrod also rendered valuable assistance in explaining the points of interest on the route. After leaving the Ledbury Station, Mr. Symonds gave a short address on the geology of the Old Red Sandstone district further to the west, and of the upper portion of the Silurian system. In the Railway cutting a fine section of the "Passage Beds" is exposed. The famous *Auchenaspis* layer was pointed out and several specimens of this peculiar fish were exhibited. The route lay over the Upper Ludlow, to the Aymestry limestone of Dog Hill, which is nearly in a vertical position, and yields the characteristic fossils of the formation. The Lower Ludlow is exposed further on, and in a deep road cutting the members had an opportunity of getting numerous fossils. At the Somers' Arms, Eastnor, a comfortable luncheon was provided, after which one section visited the pretty church in the adjoining park, while the remainder strolled about the hills, and at length inspected the ruins of Bronsil Castle, a picturesque relic, surrounded by a moat, and affording many rare varieties of plants. In the vicinity, one of the peculiar trap bosses which are scattered about the whole of this district, forms a rounded mound, and was visited by the Excursionists. At the Obelisk Hill the two parties united, and proceeded to while away an hour in fossil hunting among the Llandovery rocks there exposed. From this point the road led by a gentle ascent to the summit of the ridge, along which runs a boundary track marking the division between the Counties of Worcester and Hereford. Here, with a vast panorama of undulating country shading into a background of rugged hills, and cloudy peaks in the dim distance, Mr. Symonds gave an interesting description of the western scene. The stand point was the syenitic axis on which the stratified rocks repose. A little distance to the South the Black Shales in the valley of the white-leaved oak, represent the Cambrian rocks. To these succeed the Llandovery, Wenlock, and Ludlow series, in well-wooded ridges; while beyond stretches a vast area of Old Red Sandstone. To the East, the ancient straits of Malvern lay admirably defined, the Cotteswolds, which doubtless once formed a line of sea cliff at that remote period, bounding the view in that direction. After a considerable halt, the party proceeded along the line of the hills in the direction of Malvern, visiting on the way the Giant's Cave, where tradition asserts that one of those mythical personages lived, and at times held savage warfare with his enemies; and also the less fabulous encampment on the Herefordshire Beacon, which is generally admitted to have been the work of the ancient Britons. Shortly after seven o'clock all sat down to tea at the Link Hotel, and at the conclusion a cordial vote of thanks was passed to the Rev. W. Symonds and Dr. Grindrod for their valuable assistance. The Rev. W. Symonds, in acknowledging the vote, alluded to the varied pleasures which result from a study of the wonders of nature in the field, and expressed the pleasure which it afforded him to meet the Midland Society. A communication by Mr. Capewell, was made very hastily (owing to lack of time) relative to a new fossil from the Silurian rocks of Dudley, which he exhibited to the meeting, and which had, a short time before been obtained by Mr. Johnson. The following note has been received from Mr. Capewell, and gives the substance of the communication referred to:—the fossil is in good preservation and has been photographed.

"Abberley House, Dudley, July 1st, 1863.

"The Fossil that I was enabled through the kindness of Mr. Johnson to introduce to the meeting yesterday, I believe to be an Echinoderm, intermediate in character between *Astrophyton* and *Comatula*, thus supplying a link between the Asteroids and Crinoids.

The discovery of this addition to the Silurian fauna is very important, and as equally interesting to the naturalists as any of our extinct fossil forms from the lowest Annelide to the gigantic *Pachyderm*. It may have appeared presumptuous upon the part of so humble an anatomist as myself to venture my opinion, but I am happy to say it has been confirmed by naturalists of known authority, who have come to their conclusions through the same anatomical characteristics shewn in the specimen from which I first formed my diagnosis.

I regret much that time did not permit me to express my views more fully upon this interesting and unique Echinoderm. I felt, however short my communication may have been, that as a member of our Society I had a duty to perform in bringing the subject before its members, in order that through them it may be published to the world. I hope, at a future day, to read at one of the Society's meetings, a paper in which this new order will be first described and established.

I forgot that I mentioned a few of its anatomical characters, viz. : The madreporic looking body, the external entrance to the sand tube, the function of which is hitherto undetermined satisfactorily, and which assumes various forms in the different genera of Echinoderms. The opening for the tubular, suctoral feet, and the peculiar rough scaly markings of the rays exactly similar to the sculpture upon the shell of the *Pterygotus*."

The substance of Mr. Chas. Twamley's paper is not yet ready ; it will be reserved for the next proceedings.

Corrections in former List of Members published in March last.

Bailey, W., Oaken, Wolverhampton

Bowen, J., Bilston

Burne, T., Llanfyrnach, St. Clear's, S.W.

Bowkley, Silas, F.G.S., Batman's Hill

Caddick, James, 183, Bilston Road, Wolverhampton

Cooksey, Joseph, West Bromwich

Cooksey, J. H., do.

Eagles, Henry, Walsall

Fellows, Miss, Waterloo Road, Wolverhampton

Fellows, J. U., Walsall

Fletcher, Captain, M.A., F.R.S., instead of F.S.A.,

Gibbons, Benj., Athol House, Edgbaston

Marsh, William, Oldbury

Parton, T., Ettingshall

Roper, Thomas, Bilston

Stone, Rev. J., Capponfield, Bilston

Wollaston, Dr., Stafford

APPENDIX

TO THE

LIST OF MEMBERS,

Published in March, 1863.

The Secretaries particularly request that any errors in the previous List or in the present Appendix may be communicated to them.

Anderson, Professor, Queen's College, Birmingham

Bagnall, J. N., Shenstone

Bourne, W., Dudley

Bourne, W. C., Wolverhampton Street, Dudley

Bailey, S., Solicitor, West Bromwich

Boxer, Rev. T., Willenhall

Brigstocke, Dr., Bath Buildings, Wolverhampton

Bowkley, Alfred, Batman's Hill

Barnett, H., Coseley

Bailey, T. Abishai, Ocker Hill

Barnard, E., Stourbridge

Cloughton, Rev. T. L., Kidderminster

Cooper, T., Wordsley

Crewe, T. Dudley

Crewe, William, Dudley

Colbourne, Al., Woodsetton

Cartwright, J., Dudley

Cartwright, Henry, do.

Cotton, F. W., Walsall

Compson, Rev. J., Great Wyrley

Collis, W., Mining Engineer, Stourbridge

Cotterill, Wm., 6, Digbeth, Walsall

Checkley, Samuel, Pelsall

Cartwright, Mrs., The Leasowes, Wolverhampton

Dudley, Right Honourable Earl of

Davies, W., Surveyor, Willenhall

Dalton, Rev. George, St. Paul's, Wolverhampton

Foster, Chas., M.P., Haunch Hall
 Fisher, F. H., Oak Farm

Garman, W. C., Bridge Street, Wednesbury
 Garman, John, Holyhead Road, do.
 Green, J., Chemist, West Bromwich

Hambleton, Joseph Marylebone Church Cottage, 17, Marylebone
 Road, London
 Holden, A., Dudley
 Hodson, George, Hall Street, Willenhall
 Haden, W. H., Dixon's Green
 Higham, Fredk., Wolverhampton
 Hooper, Edwin, West Bromwich
 Hickman, Geo. H., do.
 Higham, George, Builder, Castle Street, Wolverhampton

Jobson, Robert, Dudley
 Johnson, Henry, junr., Dudley

Lichfield, Right Hon. Earl of
 Lea, W., junr., Goldthorn Hill
 Lea, J., junr., do.
 Long, W., Woodside
 Lindop, A., Bloxwich
 Longman, Rev. T., Sedgley Park School

Mander, Elisha, Bull Street, Birmingham
 Moore, Rev. Canon, Sedgley Park School
 Mac Gahren, Rev. J. J., Dudley
 Murcott, J., Waterloo Road, Wolverhampton
 Murcott, J. L., do, do.
 Milner, A., Bloxwich
 Madeley, W., Tiled House
 Myers, Rev. E., Summer Lane, Birmingham
 Mac Lean, J. R., Walsall
 Moore, F. W., Quinton, Birmingham
 Millward, John, Civil Engineer, Stourbridge

North, F. W., Tipton
 North, Frederick, do.

Orford, C. W., Lifford
 Osman, Rev. W., Colebrook Terrace, Waterloo Road, Wolver-
 hampton

Phillips, Mrs. C. J., New Street, Birmingham
 Perry, George, The Croft, Oldswinford
 Pugh, Edward, Bilston
 Powell, Thomas, Goldthorn Hill

Round, T. Hill, Tipton
 Rogers, E., Dudley
 Rogers, J., do.

Renaud, E. J., do.
 Rudge, Samuel, do.
 Rollaston, Thomas, Surveyor, West Bromwich

Sheridan, H. B., M.P., Bellfield House, Fulham
 Shaw, Richard, Pennfields
 Shann, George, Tettenhall
 Spruce, William, Pensnett
 Spruce, Samuel, Tamworth
 Southern, T., Wednesbury
 Sylvester, Miss, Oldbury Road, Smethwick
 Sylvester, John, do. do.
 Slade, Rev. J. J., Netherton
 Smith, Smallman F., Architect, Stourbridge
 Steen, J., Market Place, Wolverhampton
 Stokes, Frederick, Great Barr

Thompson, George, Hill Top
 Turner, C. J., Dudley
 Terry, E., junr., do.
 Thomason, George, Architect, Bennett's Hill, Birmingham
 Taylor, Richard, Bridgnorth
 Turner, E. J., Dudley
 Totty, Miss, St. Mark's Place, Wolverhampton
 Turton, Frederick, Surgeon, Wolverhampton

Underhill, T., Toll End

Vernon, H. Foley, M.P., Hanbury Hall, Droitwich

Walker, Bernard P., Wolverhampton
 Woodhouse, S., Dudley
 Wilkes, Martin, Goldthorn Hill
 Whiteley, Rev. J., Pedmore
 Waterfield, W., Dudley
 Wood, Thomas, Netherton
 Westley, Charles, Dudley
 Westwood, Edward, Oldswinford
 Whyte, Joseph, Dudley
 Williams, Richard, Wednesbury
 Wylie, A., Handsworth
 Woolridge, Benjamin, Land Agent, Stourbridge
 Whitcreave, Henry, Moseley Court, Wolverhampton
