DISCUSSION.

Mr. SEELEY thought it likely that Mr. Hulke would eventually be led to reestablish his genus *Enthekiodon*. He remarked on the peculiar characters presented by the specimen, and referred especially to the coracoids, which were unlike those of *Ichthyosaurus*, but presented a close resemblance to those of *Plesiosaurus*. He considered that there were indications of its having been connected with a cartilaginous sternum. The scapula furnished an important difference in its widening, which formed a distinct acromion process. Mr. Seeley remarked that double-headed ribs similarly attached occur only in animals with a four-chambered heart, and that, considering this and other characters, there was no reason for placing *Ichthyosaurus* lower than among the highest Saurians*. He considered that the Teleosaurian snout differed from all known types.

Dr. MACDONALD believed that what is called the coracoid has nothing to do with the shoulder-girdle, and thought it might be a part of the palate.

Mr. MANSEL stated, in answer to the President, that the fossils were obtained from about the middle of the Kimmeridge Clay.

Mr. ETHERIDGE suggested that it would be desirable to ascertain whether the horizon of the *Ichthyosaurus* described was the same as that of the specimens from Ely.

Mr. GWYN JEFFREYS inquired as to the food and habits of the *Ichthyosaurus*.

Mr. HULKE, in reply, stated that, from the presence of a stain and of numerous small scales under the ribs, the food of the *Ichthyosaurus* probably consisted of Squids and small fishes. He showed that the so-called coracoid was clearly a part of the shoulder-girdle.

JUNE 21, 1871.

Robert John Watson, Esq., B.A., Assistant Master at Dulwich College; W. T. Scarth, Esq., Raby Castle, near Darlington; Gen. A. C. Bentinck, of East Court, Wokingham, and John Brooke, Esq., of the Collegiate School, Newark, were elected Fellows of the Society.

The following communications were read:—

1. *On SOME SUPPOSED VEGETABLE FOSSILS.* By WILLIAM CARRUTHERS.

[PLATE XIX.]

THE baneful influence of the imagination in science is seldom more clearly seen than in the way in which fossil botany has been too often pursued. The determination of the name of a recognizable

* Having since seen the specimen, Mr. Seeley believes that the truncated margin was *anterior*, and abutted against the interclavicle (episternum); so that the *posterior* margins of these coracoid bones are similar to the same margins in *Ichthyosaurus*, and there is no evidence of the animal having had a sternum.

fragment can of course be made by any one who can intelligently compare a specimen with a drawing or a description; but the interpretation of the affinities of a fossil or the restoration of a plant from the few fragments known, can be accomplished only by one who has some acquaintance with living organisms, and with the essential and non-essential characters which combine or separate them. When this knowledge is wanting, a lively imagination supplies its place to the complete satisfaction of the investigator, but to the great injury of science. From its very nature, moreover, an imaginative interpretation is more tenaciously adhered to by its author than if it were the legitimate deduction from known facts; and it is more satisfactory, because it does not present the difficulties that are always encountered in *real life*. It is quite in keeping with this that a considerable contributor to the subject of fossil-botany has declared that a knowledge of recent plants is a serious hindrance to the investigation of fossil vegetables—and that another has recently expounded in a science-lecture his important determination of the affinities of *Lepidodendron* and *Calamites* to *Lycopodium* and *Equisetum*, although his descriptions make it evident that he never has examined, and probably never has seen a single specimen of either a club-moss or a mare's-tail in his life.

I propose in this paper to call attention to some of the specimens which I have either met with in collections, or have had sent to me as fossil plants, but which have no connexion with the vegetable kingdom. Instead of setting them aside as non-vegetable, I have taken advantage of the opportunities afforded by my connexion with the British Museum, and especially of the important assistance of my friend Mr. Thomas Davies, to determine what they are.

It would be curious to trace such errors in scientific works, and show how frequently careful observers have thought that they had the most perfect foliage in dendritic crystals, and beautiful wood-structure in stalagmites. But I have encountered errors more remarkable than these, now happily exploded. Among others I may mention:—a curious form of calamite from a particular bed in the South Wales coal-field which turned out to be the fragment of the handle of a Wedgewood basalt tea-pot; a branching part of the root of a great tree, the remainder of which was yet *in situ* and could be obtained, converted into metallic lead; and a fragment of exogenous wood showing the openings of the medullary rays, which was a singularly altered piece of shale or slate from the wall of a vitrified fort.

The first specimen to which I would ask special attention is a supposed fruit figured and described by Sternberg in his '*Flora der Vorwelt*,' tab. ix. fig. 2, as *Carpolites umbonatus*. These are round, flattened bodies, with a glazy polished surface and a central nucleus (Pl. XIX. figs. 12–17); they sometimes separate from the matrix enveloping them, and then appear to be fruits, with their pericarp converted into a thin shining layer of coal, like the *Trigonocarpons* that are found in similar beds. On careful examination, however, it is seen that the glazy surface is not produced by a foreign substance,

but is the material of the bed polished in some way—and, further, that the detached fruit-like body has many layers of such glazed surfaces, subparallel to each other, and all separated by the ordinary substance of the bed, which thus makes up the body of the so-called fruit. The glazed laminæ originate from the somewhat granular nucleus. There frequently occur on the same hand-specimen small patches of similarly glazed surfaces with irregular outlines (Pl. XIX. fig. 12), to which the name *Slickenside* has been incorrectly applied; this term is properly employed and should be restricted to designate the smooth and polished appearance produced by enormous friction on the contiguous surfaces of a fault. The structures, however, in shale, to which the name is applied are confined to the stratum in which they occur, and never pass from one surface to the other; they occupy all positions in the bed, and are isolated or sometimes united at angles more or less acute; the polished surfaces are frequently crumpled and waved. All these points in their structure show that they are not due to a force external to the bed, and that the polishing has not been produced by the sliding backwards and forwards of the one surface on the other. Dr. Fleming carefully investigated these appearances, and proposed what appears to be a very satisfactory explanation of their origin. He believed them to have been produced in cavities in a comparatively soft plastic matter by the presence of water or gas contained in the cavities, and that the specular aspect was the casting or impression of the fluid substance*. These limited slickensides, or as I would prefer to call them *fluid-casts*, occur in rocks which have been at one time or other in a more or less viscous or tenacious condition; they are found in argillaceous rocks of all ages. So also are the fruit-like bodies which I have described; I have obtained them from the shale-beds of the Coal-measures in England, Wales, Scotland, and North America, and from the Newer Tertiary clays of Ulm, Württemberg; they have been figured from the Coal-measures of Germany, and from the Permian rocks of Saxony. The granular nucleus which is found in the centre of these fruit-like bodies, was, I believe, the source of the gaseous substance which has left its impress on the glazed surface. This nucleus appears to me to have been a crystalline concretion, which subsequently decomposed; and the gas then given off spread outwards as it was produced in the planes of stratification, this being the direction of least resistance.

These fluid-casts were figured by Rhode in his 'Beiträge zur Pflanzenkunde der Vorwelt' (1820) pls. vi., vii., ix., and x. The first two plates give a faithful representation of the objects; but a little play is given to the imagination in plate ix.; and its unfettered operation is seen in the tenth plate, where the different polished surfaces are converted into the petals of flowers, and the whole are associated with foliage for which a species of *Veronica* has apparently supplied the design.

The two following species have been based on these fluid-casts:—

* "Dr. Fleming on the structural characters of Rocks," Proc. Roy. Soc. Edin. vol. iii. p. 170.

1. *CARPOLITES UMBONATUS*, Sternb. *Flora d. Vorwelt*: Tent. p. xli, tab. ix. fig. 2.

Cardiocarpum umbonatum, Bronn, *Leth. Geogn.* vol. i. p. 37, tab. viii. fig. 3.

Guilielmites umbonatus, Gein. *Leitpflanzen d. perm. Form.* p. 19.

Quercites palæococcus, Unger, *vide* specimen in the Bruckmann collection, British Museum.

2. *GUILIELMITES PERMIANUS*, Gein. *Die Leitpflanzen der permischen Formation*, p. 19, tab. ii. fig. 6-9.

Carpolithes permianus, Schimper, *Traité Pal. Vég.* vol. ii. p. 226.

Geinitz established the genus *Guilielmites* for the reception of these supposed fruits, because of their resemblance to the fruit of *Guilielma speciosa*, Martius, a palm from Brazil. Schimper places *Guilielmites permianus* among the fruits which he considers to be related to the seeds of *Cycadææ*; while *G. umbonatus* is not noticed by him; it may be either rejected as a spurious fossil, unintentionally overlooked, or referred to a place in the vegetable kingdom which his valuable work has not yet overtaken.

There occur not unfrequently in the Stonesfield slate roundish flattened bodies (Pl. XIX. figs. 4-7), most frequently exhibiting only the amorphous cast of the organism in which they were originally moulded, and lying loose in the cavity of the matrix, but occasionally inclosed in a dark-coloured polished covering. These have been considered to be fruits; and they so closely resemble the aspect of the ripe seed of a chestnut that it is not to be wondered that they are always placed amongst vegetable fossils in museums. Some time ago the Rev. P. B. Brodie, F.G.S., was so good as to send me his large collection of Stonesfield-slate remains for investigation. I have already described from them an interesting Araucarian cone. There were in his collection several specimens of these round bodies, one with the dark covering entire, and another with it partially removed. Besides these I have examined a large series in the Oxford Museum, and several in the British Museum. The continuous nature of the covering, without any indications of a base or apex, which would have been indicated had it been a fruit, or of the hilum, had it been a seed, made me doubt its vegetable nature; and the uniform thickness and continuity of the covering suggested that these bodies might be eggs. Fortunately the surface yet exhibited sufficient markings to assist in determining whether this was the case or not. After the examination of a considerable series of eggs in the zoological collections of the Museum, I discovered that the sculpturing on the surface agreed very closely with that on the eggs of reptiles, and especially those of turtles. This determination was confirmed when I subsequently ascertained that the bony plates of Chelonians were not uncommon in the Stonesfield slate. Besides turtles, however, there occur also in this deposit the remains of Pterodactyles; and it is not improbable that they may be, as suggested by Mr. Seeley, the

eggs of these flying lizards ('Ornithosauria,' p. 106). That they are reptilian eggs there cannot be any doubt; and as they add somewhat to the knowledge of the Reptilia of the Secondary rocks, and are likely to be quoted by writers, I venture to give them a specific name.

Mr. Buckman has already, in the Quarterly Journal of this Society, described some eggs which he discovered in the Great Oolite of Cirencester. From their form he determined them to be reptilian; and on examining the sculpturing on the surface of the egg, I find his determination is confirmed. He proposed for them the generic name *Oolithes*; and, employing this, I now add to the oblong form described by him the round Stonesfield eggs as a second species, with the designation *Oolithes sphaericus*.

The Rev. Thomas Fox, of Brixton, Isle of Wight, has supplied me with another and much smaller egg, which he obtained from the Wealden in that locality, and which he also believed to be a fruit.

The three species may be thus characterized:—

OOLITHES, Buckman, Quart. Journ. Geol. Soc. vol. xv. p. 107.

O. BATHONICÆ, Buckman, Quart. Journ. Geol. Soc. vol. xvi. p. 107. (Pl. XIX. figs. 8 & 11.)

Eggs ovate, twice as long as broad.

Locality. Great Oolite of Cirencester.

O. SPHÆRICUS, sp. nov. (Pl. XIX. figs. 4-7, 10.)

Eggs globular, about three quarters of an inch in diameter.

Locality. Stonesfield Slate, Stonesfield.

O. OBTUSATUS, sp. nov. (Pl. XIX. figs. 1-3.)

Egg small, subglobular, obtuse on one side, about three eighths of an inch in diameter.

Locality. Wealden of Brixton, Isle of Wight.

Count Sternberg, in his great work on fossil plants, describes a supposed Alga from Solenhofen under the name of *Cystoseirites nutans* ('Flora der Vorwelt,' fasc. v. & vi. p. 35, 1833), having a frond with linear branches bearing opposite, linear-lanceolate, acuminate, falcate, and spreading leaves with a single midrib; and the figure (*l. c.* pl. viii. fig. 1) agrees with the description, and without doubt accurately represents the specimen. It has been since ascertained that the drawing was made from an imperfect specimen of a cuttle-fish, in which the body is wanting and the fleshy arms have perished, leaving only their horny hooks somewhat in the position they occupied in the animal. These Sternberg mistook for the opposite leaves of an Alga. Münster figured a more perfect specimen, and gave to it the name of *Acanthoteuthis speciosa* (Beiträge, fasc. i. p. 105, pl. ix. 1843).

Among the specimens for the examination of which I am indebted to the Rev. P. B. Brodie there is a delicate cuttle-bone, which so closely resembles a leaf that it is not to be wondered that it was

placed among the vegetable fossils. It belongs to the genus *Teudopsis*, Deslongchamps, which is distinguished from *Loligo* only by the different form of its horny pen. In the recent genus the pen is lanceolate, with a long and slender shaft in front, while in *Teudopsis* it is spatuliform, with a short and somewhat broad shaft in front. Specimens found at Calvados show the ink-bag still preserved and in its proper position.

To this I propose to give the name of *Teudopsis Brodiei*. This interesting fossil was obtained by the Rev. P. B. Brodie from the insect-bed of the Purbeck series of Dorsetshire, in which he has done such important service to geology by his patient and persevering investigation of the fragmentary remains of insects buried in it.

The species hitherto known are all from the Upper Lias of France or Württemberg; this species, therefore, carries the form somewhat higher in the geological series. The following diagnosis will be sufficient to distinguish it:—

TEUDOPSIS BRODIEI, sp. nov.

The horny bone anteriorly elongated and tapering to the (broadish) apex. The boundary lines of the anterior portion subconcave, extending two-thirds down the bone, where it reaches its greatest width; the posterior portion oval, with a blunt termination. The whole surface is marked by faint longitudinal striæ, which diverge outwards on the expanded portion of the bone.

Teudopsis Brodiei.

EXPLANATION OF PLATE XIX.

Figs. 1-3. *Oolites obtusatus*, Carr.

Figs. 1 & 2, natural size. The ruptured opening, through which the clay filling the interior obtained access to it, is shown in fig. 2. Fig. 3.

Fragment of the shell, magnified, to show the markings on the surface.

Figs. 4-7, 10. *Oolites sphericus*, Carr.

Fig. 4. Specimen in which the amorphous material filling the cavity of the egg remains. Figs. 5, 6. Two views of the same egg nearly covered with its shell. Fig. 7. The internal cast of another, showing, around the edge where it is still inclosed in the matrix, portions of the shell still remaining. These figures are the size of nature. Fig. 10. Fragment of the shell, magnified, to show the markings on the surface.

Figs. 8, 11. *Oolites bathonica*, Buckman.

Fig. 8. Natural size. Fig. 11. Fragment of the cast of the shell, showing the markings of the surface.

Fig. 9. Fragment of the shell of a recent Turtle.

Figs. 12-17. Fluid-casts in shale from Carboniferous rocks.

Fig. 12. Exhibiting three small fruit-like casts, and a flat irregular-shaped cast. From South Wales. Figs. 13, 15. Specimens from Cape Breton, N. America. Figs. 14, 17. Specimens from South Wales. Fig. 16. Specimen from Old Cumnock, Ayrshire. All natural size.

W.G. Smith, F.L.S. fec.

W. West & Co. imp.

Supposed Vegetable Fossils.

DISCUSSION.

Mr. SEELEY remarked, as to the compressed spheroids found in so many rocks, that there was a difficulty in accepting the view of their originating in fluid vesicles, though he was unable to suggest any other theory by which to account for them. He observed that the eggs from the Stonesfield Slate closely resemble those of some birds in the pitting of the egg-shell, which differed from the pitting on such reptile-eggs as he had examined—and that it was of the highest interest to find such eggs in strata containing so many remains of ornithosaurian forms, such as *Rhamphorhynchus* and *Pterodactylus*, of which latter genus these were probably the eggs.

Prof. RUPERT JONES fully recognized the ingenious explanation of the bubble-formed limited slickensides that looked so much like possible fossil fruits, and Mr. Carruthers's masterly treatment of the other specimens; but he wished that the author would take up the subject exhaustively, and define the nature of other supposed vegetable fossils, such as the so-called fucoids, *Palæochorda*, *Palæophyton*, *Oldhamia*, &c., many, if not all, of which Prof. Jones thought to be due to galleries and other tracks made by Crustaceans.

Prof. RAMSAY had known many instances of such blunders as those pointed out, made, not by experienced geologists, but by those unacquainted with the science. Though he had never regarded the flattened spheroids as fossils, he was unable to account for their presence in the clay-beds of different ages.

Mr. HULKE inquired whether Mr. Carruthers regarded the limited slickensides common in the Kimmeridge shales as due to gaseous origin. He remarked on the rarity of Pterodactylian remains as compared with those of other Saurians in the Wealden beds, in which the presumed eggs of Pterodactyle were found.

Mr. SEELEY did not regard the Wealden egg as that of a Pterodactyle.

Mr. CARRUTHERS, in reply, remarked that the local slickensides mentioned by Mr. Hulke differed in character from those to which he had referred.

2. NOTES on the GEOLOGY of PART of the COUNTY of DONEGAL.

By A. H. GREEN, Esq., F.G.S.

[Abstract.]

In this paper the author described the geological structure of the country in the neighbourhood of the Errigal Mountain, with the view of demonstrating the occurrence in this district of an interstratification with mica-schist of beds of rock which can hardly be distinguished from granite, the very gradual passage from alternations of granitic gneiss and mica-schist into granite alone, and the marked traces of bedding and other signs of stratification that appear in the granite, to which the author ascribed a metamorphic origin. He also noticed the marks of ice-action observed by him in this region, and referred especially to some remarkable fluted bosses of quartzite, and to the formation of some small lakes by the scooping action of ice.