remarked upon the resemblance of the beak in the latter to that of the Tortoises, especially *Trionyx*, and suggested that the jaws might have had a horny covering.

Dr. MERYON inquired as to the implantation of the teeth in the jaws of *Hyperodapedon*, and suggested that the position and direction of the orbits were not accordant with terrestrial habits, and also that the absence of processes on the ribs indicated a flexibility of the body consistent with a fluviatile mode of life.

Prof. HUXLEY showed that no conclusion could be drawn from the want of processes on the ribs or the position of the orbits as to the habits of the animal, and remarked that the processes in *Sphenodon* were not anchylosed to the ribs; he considered it possible, but not probable, that the jaws had a horny covering. He stated that in using the term "poikilitic," he was desirous of indicating that while several marine formations with changing forms of life succeeded each other, the terrestrial fauna may, in certain cases, have been continuous. He believed that terrestrial forms were at least as persistent as marine.

Mr. CARRUTHERS remarked that the Permian vegetation showed Mesozoic affinities, and in fact that the commencement of the Mesozoic flora was to be sought in the Permian.

JANUARY 27th, 1869.

Arnold Lupton, Esq., Salter Gate, Chesterfield, and Dr. George Rogers, of Longwood Asylum, Bristol, were elected Fellows of the Society.

The following communications were read :—

1. *Notes on GRAPTOLITES and allied FOSSILS occurring in IRELAND.*
By WILLIAM HELLIER BAILY, F.L.S., F.G.S.

THE remarks I am about to offer upon a group of fossils of great importance in determining strata of Silurian age is principally intended to record the species I have been enabled to identify in Irish strata. I shall avoid discussing the question as to the exact position Graptolites occupy in the animal kingdom, except to observe that the preponderance of evidence is in favour of their alliance with the Hydrozoa; nor will I give any details of their structure, this subject having been lately so ably discussed by Mr. William Carruthers in the new edition of 'Siluria,' and in his paper entitled "A revision of the British Graptolites"*.

Dr. H. A. Nicholson has also added considerably to our knowledge of this interesting group of extinct Zoophytic organisms.

I will now briefly allude to the localities in Ireland where these fossils occur, nearly all of them having been visited by me, and

* Geological Magazine, vol. v. p. 64 (1868).

numerous specimens examined in connexion with my duties on the Geological Survey of that country.

Commencing with the south of Ireland, the first place to be noticed is in the county of Waterford, on the banks of a stream called the Dalligan river, five miles N.E. of Dungarvan, where dark grey argillaceous shales occur full of the small diverging Graptolite, *Didymograpsus sextans*, Hall; they were first discovered at this place by Mr. Charles Galvan, of the Geological Survey. In the list of fossils, appendix to 'Siluria,' 1867, the geological range of this species is limited to the Llandeilo group of rocks. Proceeding towards the city of Waterford, at Lady Elizabeth's Cove, in Tramore Bay, highly inclined black slates dipping 80° N.E. may be seen on the shore just below high-water mark, penetrated by a greenstone dyke and in close proximity to rocks containing a profusion of fossils of Caradoc-Bala age; these slates are of a dull earthy character, much impregnated with pyrites, and yielded the following species:—

Graptolithus Hisingeri, Carruthers (=	Diplograpsus pristis, Hisinger.
sagittarius).	Climacograpsus bicornis, Hall.
* <i>Didymograpsus sextans</i> , Hall.	Dicranograpsus ramosus, Hall.
<i>Cladograpsus gracilis</i> , Hall.	

together with the following reticulated and many-branching forms, the affinities of which to Graptolites I agree with Mr. Carruthers in considering to be very doubtful,—

Dictyonema, sp.	Dendrograpsus flexuosus or diffusus.
Callograpsus elegans or Salteri.	

At a second locality, in Tramore Bay, *Diplograpsus pristis* occurred in grey slate, associated with Trilobites.

A little north-west of the town of Waterford, on the left bank of the river Suir, are cliffs 150 feet in height, composed for the most part of unfossiliferous Silurian flags and slates, penetrated by masses of Greenstone Porphyry; at the base of the cliff, which is here called the Bilberry rock, a mass of much-jointed and finely laminated dark grey slates, highly inclined, and in some parts stained red and yellow, were to be seen when I visited the place some months since; as, however, it, with the flaggy beds immediately adjoining, was being quarried away, this fine Graptolite-locality may soon disappear, or has perhaps already disappeared. These slates are crowded with well-defined, although much compressed Graptolites; and as the layers separate with great facility, good specimens were readily obtained. The species are few, but abundantly repeated, *Diplograpsus pristis* being the most numerous: it occurs with prolonged axis and proximal termination. The next species in point of numbers is a diverging form, the initial process being well shown in some examples which I believe to be identical with the species Dr. Nicholson figures †, and refers to *Didymograpsus* (*Graptolithus*) *flaccidus*, Hall. Mr. Carruthers has described this species under the name of *Didymograpsus elegans*, doubting its identity with Hall's species; I agree with him

* The asterisks prefixed to species indicate their comparative abundance.

† Annals and Magazine of Natural History, ser. 4, vol. i. pl. 3. fig. 14.

in believing it to be distinct, the proportions of the polypary being much greater, and the number of serratures to the inch not much more than half those in *G. flaccidus* as described by Professor Hall. The only other species observed at this place was a single-celled form, which I have with some hesitation referred to *G. Hisingeri* (= *sagittarius*).

At Newtown Head, Waterford Harbour, a single-celled Graptolite occurs sparingly with numerous Caradoc-Bala fossils; this I have doubtfully referred to *G. priodon*.

In the adjoining county of Wexford there are several good Graptolite-localities, mostly in rocks on the shore of Courtown harbour. At Ballymoney, near Gorey, black slates occur with *Diplograpsus pristis*, much distorted by cleavage; and a little south of Ballymoney fishery the following species were collected,—

Graptolithus Hisingeri? (= <i>sagittarius</i>).	Diplograpsus mucronatus.
Didymograpsus sextans.	— teretiusculus.
— flaccidus,	Dicranograpsus ramosus.
Diplograpsus pristis.	

At Ballinatray, near Gorey, fine examples of *Dicranograpsus ramosus* were collected. West of Ballinatray the black slates, much distorted by cleavage, contain an abundance of *Diplograpsus pristis*, accompanied by *Cyrtograpsus gracilis*; and a little south of Breanoge Head, near Courtown, a Graptolite, which I have referred to *G. Sedgwicki*, was collected by Mr. Galvan from a compact greenish slaty rock, such as Graptolites are not usually found in. At Tinnaglogh, four miles N.N.E. of Duncannon, Wexford, the black argillaceous slates abound with *Diplograpsus pristis* in a very perfect condition, showing prolonged axis and proximal termination. At Churchtown, one mile north of Tagoat, and about 7 miles S.S.E. of Wexford, the remarkable little branched Graptolite *Didymograpsus caduceus*, Salter, is not uncommon, accompanied by what I believe to be *Graptolithus Hisingeri* (= *sagittarius*), and associated with fossils of Caradoc-Bala age.

In the south-west of Ireland a few miles north of the city of Limerick, and near Six-mile Bridge, in the county of Clare, a remarkably rich locality for Graptolites was discovered by Mr. G. H. Kinahan, of the Geological Survey of Ireland, on the western flank of the Slieve Bernagh mountains. The rocks consist of black-argillaceous slates, readily separating into laminae; the fossils are disclosed in the most perfect condition, the prevailing species being *Diplograpsus pristis* in all its varieties, resulting from pressure in various directions: examples having very long filamentary processes proceeding from the mouth of the cells appear to me to be identical with Hall's figures of *D. mucronatus*; this and *D. dentatus*, Brongniart, may, however, be only a more perfect condition of *D. pristis*. It is probable that the bodies I have figured and described as *Theca comeoides*, from this place*, may be, as suggested by Mr. Carruthers,

* Journal of the Geological Society of Dublin, vol. ix. 1861, pl. 4. fig. 8.

gonophores or generative buds of Graptolites (possibly of *D. pristis*), and that they are analogous to those of the Sertularidæ, as in *Sertularia fallax*, *pumila*, &c.*

The following are the species from this locality.

****Diplograpsus pristis*.

— *mucronatus*, prob. synonym.

— *bicornis*, Hall, with appendages at the proximal end as figured by Mr. Carruthers under the name of *D. pristis*.

Didymograpsus sextans.

**Cyrtograpsus gracilis* (Hall). This pretty branching species, not un-

common at this locality, is easily recognized from Hall's figure†, as characterizing the Utica slate and Hudson-River groups: of the single serrated forms, the remaining species are

Graptolithus Hisingeri (= *sagittarius*).

— *tenuis*.

About one mile and a half from this locality, and two miles south-west of Broadford, in the same county, single-celled Graptolites only were collected; these I have referred to *G. priodon*.

In the townland of Kilnacreagh, three miles east of Six-mile Bridge, the species observed were *Graptolithus priodon* and *tenuis*, with a diverging form referred to *Didymograpsus Forchhammeri*, the accompanying fossils being of an Upper-Silurian type.

At a few other places in the same county, and near to the last-named locality, there are similar Graptolites associated with Upper-Silurian fossils, as at the Townland of Glenagross, three miles and a half E.S.E. of Six-mile Bridge, where *Graptolithus priodon* is found associated with *Cardiola interrupta* and a Crinoid allied to, if not identical with, *Actinocrinus pulcher*, a Wenlock species.

At Trough Cottage, Clare, 6 miles east of Six-mile Bridge, *Graptolithus priodon* occurs associated with the same Crinoid. Half a mile E. of the preceding locality, in the same townland, *Graptolithus priodon* and *G. tenuis* were the species observed.

In the adjoining county of Tipperary, Mr. A. B. Wynne (now of the Geological Survey of India), whilst surveying the district, discovered many fossil localities; at several of them Graptolites occurred associated with Upper-Silurian fossils, such as *Euomphalus discors*, *Cardiola fibrosa* and *interrupta*, *Orthoceras*, &c. *Graptolithus priodon*, the characteristic Upper-Silurian species, and most abundant of the single-celled forms, occurs at the following localities in this county, viz.:—at Boosnafarney; Clonannon; Big Park, near Latteragh; Knocknagoogh, S.E. of Latteragh, in profusion; N.W. of Barnane House in an uncompressed state; Garrangreena; Gortnaskea; Curreeny common, &c.; and, accompanied by *Graptolithus tenuis* and *Graptolithus Hisingeri* (= *sagittarius*) at Reaghfadda.

The pretty little branching species, *Cyrtograpsus hamatus*, Baily, sp.‡, was collected by Mr. Wynne at Garrangreena and Kilmacuddy, in the same county.

On Knockshigowna Hill, nine miles north-west of Roscrea, Tip-

* Johnston's British Zoophytes, 2nd edition, p. 72, fig. 12, p. 73, pl. 11. figs. 2-4.

† Palæontology of New York, vol. i. pl. 74. fig. 6.

‡ Journal of the Geol. Society of Dublin, vol. ix. pl. 4. fig. 6.

perary, *Graptolithus priodon* is remarkably abundant in close proximity to fossils of an Upper-Llandovery type.

With the permission of the Society, I shall reserve for another occasion the continuation of this subject, when I hope to have been able to complete my examination of localities in the north of Ireland, some of which are of great interest.

DISCUSSION.

Mr. CARRUTHERS remarked that while almost all observers have referred these creatures to the *Hydrozoa*, there was an impression abroad, founded on a misconception of a remark of Prof. Huxley's, that he classed them as *Polyzoa*. He had, however, Prof. Huxley's authority for saying that he did not so regard them.

2. Notice of PLANT-REMAINS from beds interstratified with the BASALT in the county of ANTRIM. By W. H. BAILY, Esq., F.G.S.

(Abstract.)

THE deposit referred to by the author was discovered by the late Mr. G. V. Du Noyer in cuttings of the Northern Railway of Ireland, near Antrim; the plant-layer consists of a red clay deposit from 4 to 8 inches in thickness, separated by a bed of 10 or 12 feet, containing nodular iron-ore, from the underlying basalt, and by earthy beds of about equal thickness from the superficial basaltic rock.

The author regarded a large cone as that of a true *Pinus*, and branches of another coniferous tree as belonging to a *Sequoia* nearly allied to *S. Sternbergi*, Heer; of this species he thought a small imbricated cone might possibly be the fruit. Other fragments of Coniferæ seem to belong to *Cupressites* or *Taxites*. The fossils consist chiefly of leaves of true Dicotyledonous plants. The author compared some of them with species of *Rhamnites*, *Olea*, *Fagus*, and *Quercus*. Leaves of endogenous plants, such as Sedges and Grasses, occur not unfrequently. A large mass of fossil wood of dicotyledonous structure was obtained from the hæmatitic deposit. Seed-like bodies are also found. The plant-remains are accompanied by a few elytra of Beetles.

The author remarked that these plant-remains differ as a group from those of the island of Mull. Their alliance appears to be with Mid-European forms; and they are certainly of Upper-Tertiary age, probably Miocene.

DISCUSSION.

Mr. CARRUTHERS observed on the difficulty of determining species, or even genera, satisfactorily, from such fragmentary evidence as that adduced by Mr. Baily. He considered that the small cone did not belong to *Sequoia*, inasmuch as the cone of *Sequoia* was not composed of imbricated, but of adnate, peltate scales. The wood was not only dicotyledonous, but coniferous.