occurring in the eastern Himalayas, and on fully as extensive a scale. In some cases not only the loose soil, but large masses of solid rock were carried down.

Mr. DREW mentioned other instances in India of a similar character, but thought that in the western Himalayas frost also assisted in the work of destruction.

DECEMBER 4, 1872.

Edward Crane, Esq., of St. John's Lodge, Wellington Villas, Brighton; William Abbott Green, Esq., Inspector-General of Hospitals, Bengal, Marchmont House, Leyland Road, Lee, Kent; D. C. Davies, Esq., Conygree House, Oswestry; William Johnston, M.D., 6 Gloucester Terrace, Weymouth; W. M. Cameron, Esq., Drayton Lodge, South Kensington; W. H. Peacock, Esq., Hoyland and Elsecar Colliery, Barnsley; Lieut.-Gen. the Hon. A. H. Gordon, C.B., 41 Warrior Square, St. Leonards; E. Wilson, Esq., Nottingham; and Fitzhugh Bathurst Henderson, Esq., C.E., Plas Gwyn, Gob-Owen, Shropshire, were elected Fellows of the Society.

The following communications were read:—

1. *On the* TREMADOC ROCKS *in the* NEIGHBOURHOOD *of* ST. DAVID'S, SOUTH WALES *and their* FOSSIL CONTENTS. By HENRY HICKS, Esq., F.G.S.

[PLATES III.–V.]

THE occurrence near St. David's, in South Wales, of rocks supposed to be of the age of the Tremadoc Slates of North Wales, was mentioned in a Report by the late Mr. Salter and myself to the British Association in 1866; and a list of the fossils which had up to that time been discovered in them was also given. Several new forms, however, have since been found in these rocks, and some of them very recently, during researches made at Ramsey Island by Messrs. Homfray, Lightbody, Hopkinson, and Kirshaw, in conjunction with myself. The Brachiopoda were figured by Mr. Davidson in his paper "On the Earliest British Brachiopoda," in the Geological Magazine for July 1868; and a supposed land-plant was named by me *Eophyton explanatum* in the same publication for Dec. 1869; but with the exception of these, the whole of the fossils, comprising a rich and exceedingly interesting fauna, are as yet undescribed.

In the present paper I propose to describe all these new forms, and also to give some account of the lithological characters of the strata in which they occur, their relation to the other formations, and their geographical distribution in the neighbourhood of St. David's.

On the map (fig. 1) it will be seen that there are three distinct patches of these rocks shown, viz.:—at Ramsey Island, on the eastern coast; at the north end of Whitesand Bay, and extending for some distance in a N.E. direction; and in a district about five miles east of St. David's, where they occupy a considerable tract of the country.

At Ramsey Island they rest conformably on Lingula-flags, which appear here in the usual character of hard siliceous sandstones inter-

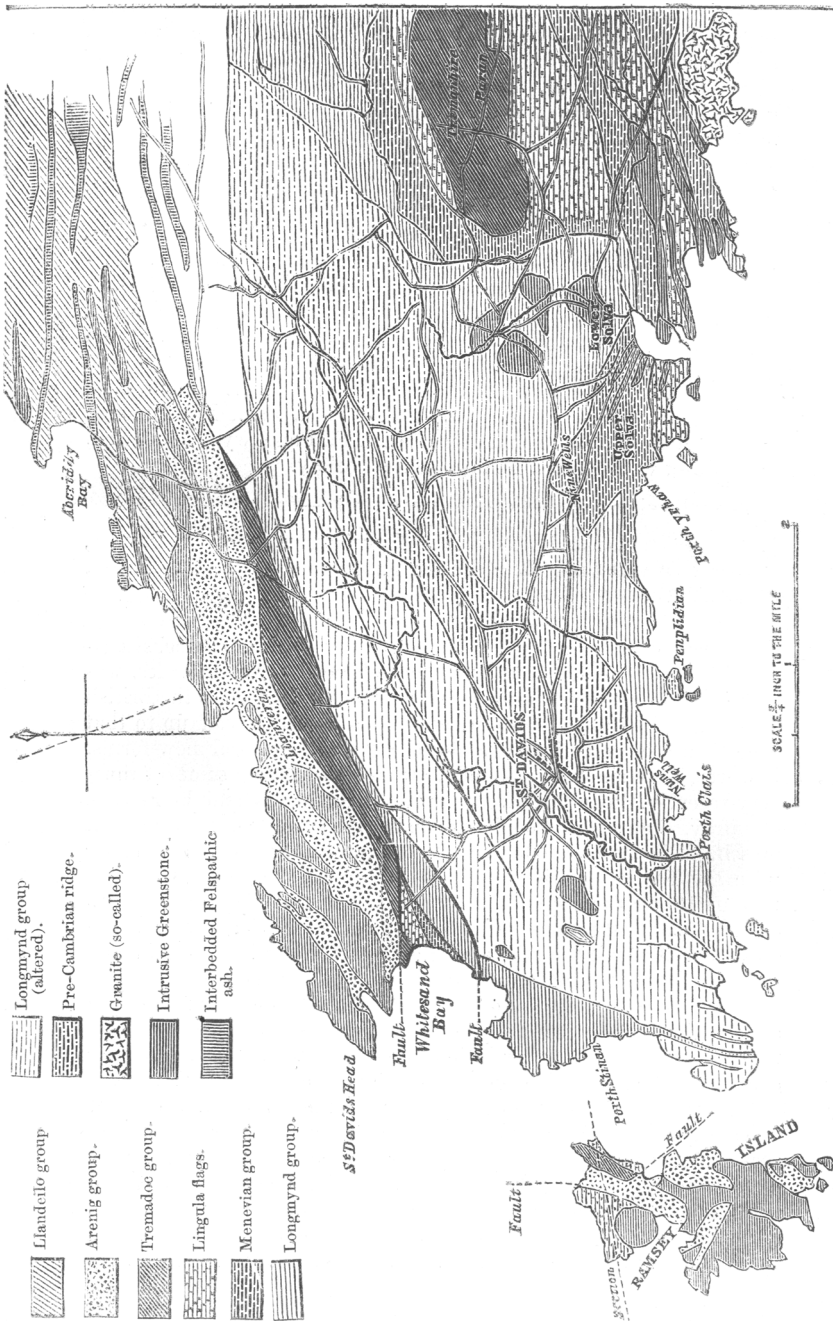
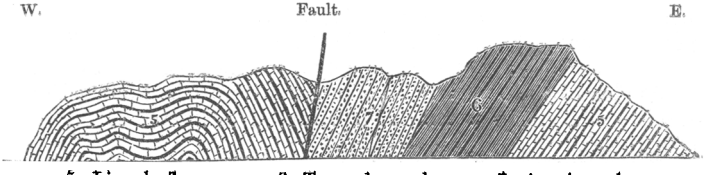


Fig. 1.—*Geological Map of St. David's.*

stratified with grey flaky slate containing *Lingulella Davisii* in great abundance. They graduate by almost insensible degrees from these as hard grey flags, then bluish grey, with some thick-bedded rock of tough texture. They have a thickness of nearly 1000 feet, with an average dip of about 60°, and the strike of the beds is from N.E. to S.W. They form the north-east point of the island, and are exposed in an excellent coast-section, with the Lingula-flags dipping under them, and the dark iron-stained Arenig slates resting upon them. It is doubtful, however, whether the latter rest conformably upon them. I am inclined to think that a fault intervenes, and that the proper thickness, as shown at some of the other places, does not occur here in consequence.

Fig. 2.—*Section across the northern part of Ramsey Island* (see Map).



5. Lingula-flags. 6. Tremadoc rocks. 7. Arenig rocks.

At Whitesand Bay they also rest conformably on Lingula-flags; but a fault running up in a north-east direction, and almost in the strike of the beds, has removed more than three fourths of their thickness, and has brought down the Arenig group in contact with them, so as to give it an appearance of resting almost conformably upon them. Further north, near Llanveran, the fault has gone eastward of the series, and they are seen again in nearly their entire thickness underlying the Arenig group.

The third patch, at Tremanhire, in the middle of the country, east of St. David's, occupies a greater area; but there are only a few quarries open, and therefore considerable difficulty has been experienced in defining its proper limits. The Lingula-flags seem everywhere to underlie the series here as at the other places; but the Arenig rocks only come in unconformably at the N. E. end of the patch. The beds have very much the same character as at Ramsey Island, with the exception that the middle portion is more of a sandstone in parts, and less cleaved. Some of the most perfect specimens have been found in these last-mentioned beds near and at a place called Paran on the map.

On the whole, however, Ramsey Island offers the best advantages for examining these rocks, and also for obtaining fossils, as the beds are there well exposed, and literally, in some parts, almost entirely made up of organic remains.

The species which have been discovered in these rocks, with the exception of *Lingulella Davisii*, are all new, as well as a few of the genera. They comprise a new genus of Trilobites, which I have named *Neseuretus*, and of which there are several species. This genus forms an interesting stage between the earlier *Conocoryphe*

[*To face page* 42.

TABLE OF THE STRATA, AND THE ORDER OF APPEARANCE OF LIFE, IN THE CAMBRIAN ROCKS OF GREAT BRITAIN.

			Lithological Characters.	Thickness of Strata.	Order of the appearance of Life.		Typical Localities.
					Genera.	Classes, Orders, &c.	
				feet.			
MIDDLE CAMBRIAN (*Sedgwick*).	PRIMORDIAL SILURIAN (*Murchison*).	UPPER CAMBRIAN (*Lyell, Salter, &c.*).	Upper Tremadoc	Iron-stained slates and flags ...	Angelinia, Conularia, Lingulocaris.		Portmadoc and Dolgelly, in North Wales.
			Middle Tremadoc	Dark earthy slates	1000	Cheirurus, Asaphus, Dictyonema.	Hydrozoa.
			Lower Tremadoc	Grey flaggy sandstones	1000	Dendrocrinus, Palasterina, Orthoceras, Glyptarca, Davidia, Modiolopsis, Niobe, Ctenodonta, Palæarca.	Crinoidea, Asteroidea, Cephalopoda. Lamellibranchiata.	Tremanhire, Ramsey Island, and Llanveran, near St. David's, in South Wales.
			Upper Lingula-flags (Dolgelly Group, *Belt*).	Soft black and bluish slates in North Wales; bluish and grey flags in South Wales.	600	Eophyton, Neseuretus, Sphærophthalmus, Dikelocephalus?, Parobolina, Peltura.	Land Plants (?).	Malvern, Dolgelly, and near Portmadoc.
			Middle Lingula-flags (Ffestiniog Group, *Belt*).	Grey arenaceous and micaceous slates and flags.	2000	Bellerophon, Hymenocaris, Buthotrephes.	Heteropoda.	Maentwrog, Dolgelly, and at Ramsey Island, near St. David's.
			Lower Lingula-flags Maentwrog Group, *Belt*).	Bluish slates and flags, and alternating bands of yellowish grey shales and sandstones.	2500	Olenus and a phyllopod crustacean.	Phyllopoda.	Neighbourhood of Maentwrog, Dolgelly, and St. David's.
LOWER CAMBRIAN (*Sedgwick*).	CAMBRIAN (*Murchison*).	LOWER CAMBRIAN (*Hicks*).	Menevian Group ...	Thick beds of sandstone with shale. Dark blue slates and flags, dark grey flags, and grey gritty beds.	600	Stenotheca, Orthis, Protocystites, Cyrtotheca.	Cystodea.	St. David's, in South Wales; and neighbourhood of Maentwrog, and Dolgelly, in North Wales.
						Carausia, Entomis, Erinnys, Holocephalina, Anopolenus, Arionellus.	Entomostraca.	
			Longmynd, or Harlech Group.	Grey, purple, and red flaggy sandstones; yellowish-grey sandstones, shales, and flags; purple sandstones, sometimes with greenish bands; red, flaggy, or shaly beds; greenish flaggy sandstones, conglomerates, and greenish ironstones.	4000 in true succession in South Wales. Supposed to be over 8000 in N. Wales.	Theca. Paradoxides. Obolella. Plutonia. Conocoryphe. Microdiscus.	Pteropoda.	St. David's, in South Wales; Harlech, Bangor, &c., in North Wales; Longmynd, in Shropshire; and Bray Head, in Ireland.
						Palæopyge. Haughtonia. Agnostus*. Histioderma. Protospongia*. Scolithus. Leperditia (?). Arenicolites. Discina. Oldhamia. Lingulella.	Trilobita. Spongida. Entomostraca (?). Plantæ (?). Brachiopoda. Polyzoa (?). Annelida.	St. David's.

* Found recently at the base of the Cambrian Rocks of St. David's.

on the one hand, and *Dikelocephalus*, *Homalonotus*, and *Calymene* on the other. In its coniform glabella, with bent furrows and faceted pleuræ, it resembles *Conocoryphe*; and in the position of its posterior facial sutures, and in its broad and many-ribbed tail, it resembles *Dikelocephalus*. The only other Trilobites are two species of *Niobe*, a well-known Tremadoc genus. In these two genera we certainly recognize a resemblance to far earlier types, and the possible progenitors of many succeeding forms. The fauna is exceedingly rich in the Lamellibranchiata, no less than twelve species, belonging to five genera, having been found. This is the more interesting as no Lamellibranchs had previously been discovered in so early a formation in Britain—nor, indeed, so far as I am able to find out, in any other country. The Echinoderms also are represented here by a beautiful starfish of the genus *Palasterina*, and by an Encrinite of the genus *Dendrocrinus*, and hence are shown to have existed at a very early period. The Cephalopoda, which have not been found in earlier formations, are also represented here by a species of *Orthoceras*. The remainder of the fauna is made up of Heteropods, Pteropods, and Brachiopods, groups which had representatives in still earlier rocks (see Table).

The conditions under which the Tremadoc rocks in the neighbourhood of St. David's were deposited seem to have been intermediate between those of the shoal and shallow water of the Lingula-flag period and those of the deep sea which must have prevailed when the fine muddy deposits of the overlying Arenig slates were being thrown down. This intermediate condition must have been particularly favourable to the existence of life, and was doubtless one of the causes of the appearance at this time of such a varied and important group of organisms.

In comparing these rocks with the Tremadoc slates of North Wales on stratigraphical grounds, a difficulty arises in the supposed unconformity mentioned by Prof. Ramsay in his memoir on North Wales as occurring there between them and the Lingula-flags—as these two groups, wherever they are exposed in the neighbourhood of St. David's, appear so closely connected, both on stratigraphical and lithological grounds that it becomes quite impossible to know exactly where the boundary-line between them, which of course in such a case is only arbitrary, should be placed. But the palæontological evidence goes to prove that they (the Tremadoc rocks) are closely allied to, if not identical with the lower portion of the Tremadoc rocks of North Wales*.

Mr. Homfray, of Portmadoc, who has carefully studied the

* The faunas, however, are in some respects considerably unlike; but the difference is doubtless to be attributed to the state of the sea at the time the rocks were deposited in each locality. In North Wales the series is made up of fine-grained slates, and hence of deep-sea deposits, and with a deep-water fauna; in South Wales, of rough-grained flags and sandstones, indicating much shallower water, and, as shown by the presence of worm-tracks, numerous lamellibranchs and brachiopods of large size, a comparatively shallow-water or mixed fauna. The absence at St. David's, in the Upper Lingula-flags, of the fine black slates which are so characteristic of the series in North Wales and at Malvern, may also be accounted for by the prevalence of shallow water in the one locality.

Tremadoc rocks of North Wales for some years, states that he has no difficulty in recognizing in these beds at St. David's the equivalents of the lower portion of the series in his district; and as evidence of their parallelism he mentions the occurrence of *Niobe*, *Dikelocephalus* (*Neseuretus*?), and an *Orthis* similar to one of the species at St. David's, but smaller, at the base of that series. It is also an interesting fact that the genus *Niobe* in both districts is only found in these lower beds; and, again, the *Dikelocephalus* mentioned is truly a *Neseuretus*, a genus which, I think, will be proved to belong to this horizon, not only in this country, but also in Canada and the United States. Prof. Hall, in 1863, in his 'Preliminary Notice of the Fauna of the Potsdam Sandstone of the Upper Mississippi Valley,' mentions that the typical species of the genus *Dikelocephalus* do not appear until we get to the later stages of the formation. This is well borne out also by researches in this country; for the forms doubtfully figured and described by Mr. Salter (in the Appendix to Prof. Ramsay's memoir) as *Dikelocephalus* from the Upper Lingula-flags and from the Lower Tremadoc rocks, are, in my opinion, species of *Neseuretus*, and the only true *Dikelocephalus* found in Wales is the *Dikelocephalus furca* from the Upper Tremadoc rocks of North Wales.

The Upper Tremadoc rocks are, in Mr. Homfray's opinion, represented at St. David's by the so-called Arenig rocks, which are known to contain several Upper Tremadoc fossils in addition to the rich fauna of Graptolites discovered during our recent researches, and which have been recognized by Mr. Hopkinson as belonging to the age of the Quebec group of Canada. According to Mr. Homfray some of these graptolites also have been discovered by Mr. Ash in the Upper Tremadoc rocks of North Wales.

In the present paper, however, I have only included the rocks below the so-called Arenig group, as known at St. David's, in the Tremadoc group, believing that the two formations are sufficiently distinct lithologically and palæontologically to be separately considered.

If Mr. Homfray's supposition, however, is proved to be correct (and it is supported by the fact that the Tremadoc series as hitherto considered is much greater in thickness in North Wales than in South Wales, and the Arenig series much less), I think it will necessitate the doing away with the name Upper Tremadoc, and also a change in the boundary line, hitherto placed above the Upper Tremadoc, and which has been looked upon as of considerable importance in stratigraphical classification, to its base, as the whole Arenig series is much more intimately allied to the overlying Llandeilo slates than it is to the underlying Tremadoc rocks as exhibited at St. David's.

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and of a deep sea in the other, at the same time. It is not at all unlikely also that the lower portion of the Tremadoc series at St. David's was deposited contemporaneously with the black beds of the Lingula-flags of North Wales, as in both cases they are the first indications of a change taking place in the sea-bottom after the long period of the shallow sea in which so many thousand feet of Lingula-flags and sandstones were deposited.

The following is a list of the fossils discovered in the Tremadoc rocks of St. David's:—

Neseuretus ramseyensis, sp. n.
—— quadratus, sp. n.
—— recurvatus, sp. n.
—— elongatus, sp. n.
—— ——, var. obesus.
Niobe menapiensis, sp. n.
—— solvensis, sp. n.
Theca Davidii, sp. n.
Orthoceras, sp.
Bellerophon ramseyensis, sp. n.
—— solvensis, sp. n.
Palasterina ramseyensis, sp. n.
Dendrocrinus cambriensis, sp. n.
Ctenodonta menapiensis, sp. n.
—— cambriensis, sp. n.
Palæarca Hopkinsoni, sp. n.
Palæarca oboloidea, sp. n.
Glyptarca primæva, sp. n.
—— Lobleyi, sp. n.
Davidia ornata, sp. n.
—— plana, sp. n.
Modiolopsis ramseyensis, sp. n.
—— Homfrayi, sp. n.
—— solvensis, sp. n.
—— cambriensis, sp. n.
Lingulella Davisii, *M'Coy*.
Lingula petalon, *Hicks*.
Obolella plicata, *Hicks*.
Orthis Carausii, *Salter*.
Orthis menapiæ, *Hicks*.
Eophyton explanatum, *Hicks*.

Description of the Fossils.

NESEURETUS, gen. nov.

Head semicircular. Glabella tapering forwards, moderately convex, and marked by three pairs of furrows, which reach about a third of the distance across, but usually bend backwards at their extremities. Eyes prominent, and situated about halfway up the head. Facial sutures distinct, the anterior run rather obliquely outwards to cut across the anterior margin, and the posterior to the hinder margin almost at the angles. Cheek-plates nearly triangular, rather wider on the outer side, posterior angles slightly produced. Thorax strongly trilobate, and composed of thirteen segments. Pleuræ faceted for rolling up. Tail about equal to a fourth of the length, wide, and sometimes truncate at the extremity; axis prominent, and composed of from eight to ten rings, lobes strongly ribbed.

In its coniform glabella with lateral furrows it resembles *Conocoryphe*; but in the position of its facial sutures, its very prominent eyes, and in its large many-ribbed and wide tail it is very distinct from that genus. The tail seems to ally it to *Dikelocephalus*; but its glabella entirely separates it from that genus. The thorax, which shows characters intermediate between *Homalonotus* and *Calymene*, is also peculiar, and unlike that of any other genus.

NESEURETUS RAMSEYENSIS, spec. nov. Pl. III. figs. 7–10 & 16–22.

Head semicircular, margined, and with the angles very slightly produced. Glabella parabolic and convex, about one third of the width and rather less than two thirds of the length of the head, and indented deeply by three lateral furrows which bend backwards at their extremities; the basal furrows reach nearly to the neck-furrows, and mark off triangular lobes on either side. Eyes prominent, faceted, and placed at a distance from the glabella equal to about half its width. Cheek-plates triangular. The thorax (Pl. III. fig. 16), which evidently belongs to this species, is strongly convex; axis tapering, with sharply raised rings; pleuræ grooved and faceted, with the fulcrum situated at about a third of the distance

across, blunt at the extremities, and usually more or less incurved, or pressed against one another as if partly rolled up. Tail wide, and more or less truncate. Axis strongly raised, and composed of ten rings, the hindermost being large and pyramidal; lobes marked by seven strong ribs, grooved towards their extremities, and reaching quite to the margin. The anterior border is deeply faceted where it receives the hindmost thoracic segment. The posterior border widened out, and almost angular at the extremities. This species occurs plentifully, and is at least four or five inches in length.

Loc. Ramsey Island, and Tremanhire, near St. David's.

NESEURETUS QUADRATUS, spec. nov. Pl. III. figs. 11–13 & 23–26.

The glabella in this species is rather narrower, more angular, and less convex than in the other species. Cheeks strongly raised, and deeply punctated, and the margin in front is covered with minute spines. The punctate surface and spinous margin, however, are not specific characters, as they occur also in the larger specimens of *N. ramseyensis*.

Of the numerous tails which have been discovered, and which apparently belong to different species, I am inclined to believe that the forms figured (figs. 23–26) belong to this species. In these the axis is narrow, the lobes wide, and the hinder border more convex than in *Neseuretus ramseyensis*. This is probably the largest of the species.

Loc. Ramsey Island and Tremanhire.

NESEURETUS RECURVATUS, spec. nov. Pl. III. figs. 5 & 6.

A small species, probably not more than an inch in length. Head wider than the body, and about a third of the whole length; surrounded by a strong and wide margin, which is raised and bent backwards in front of the glabella, and slightly produced at the angles. Glabella occupying more than three fourths of the length, and nearly a third of the width of the head, parabolic and convex in shape, and indented by three pairs of furrows, which are well marked and deep. Eyes large, very prominent, situated halfway up the head, and rather near to the glabella; free cheeks triangular in shape.

Thorax composed of thirteen segments. Axis convex, wide at the upper part, and tapering gradually towards the tail; pleuræ deeply grooved, faceted, and incurved at their extremities.

Tail wide, with a strongly raised tapering axis of eight (or more) rings; lobes ribbed, and margin incurved; slightly truncate at the extremity. One of the specimens is coiled up, and another partly so. The recurved strong margin to the head, and the long parabolic glabella, distinguish this species at a glance from any of the others.

Loc. Ramsey Island and Tremanhire.

NESEURETUS? ELONGATUS, spec. nov. Pl. III. figs. 1–3.

Ovoid in shape, widest across the head. Head semicircular, and equal to about a fourth of the length. Glabella parabolic and convex, less than one third the width, and more than three fourths the length of the head. Cheeks equally convex with the glabella. Eyes

semilunar in shape, and situated more than halfway up the head; the anterior facial sutures run upward and slightly outward, the posterior bend first under the eyes, and then run obliquely outward to the inner side of the posterior angles. Thorax composed of thirteen segments; axis strongly raised, rather narrow, in width equal to rather less than two thirds the length of the pleuræ. Pleuræ deeply grooved, faceted, and blunt at the extremities; fulcrum in the upper ones situated at about a third of the distance from the axis. Tail semicircular, and margined; axis well raised, tapering, and composed of eight segments; lobes strongly ribbed at the upper part, but very faintly so posteriorly.

This may possibly belong to another genus; but as some of the characters are those of *Neseuretus*, I prefer at present to retain it under that genus.

Loc. Ramsey Island, and Tremanhire, St. David's.

NIOBE MENAPIENSIS, spec. nov. Pl. IV. figs. 1–9.

Oval in form, from 7 to 8 inches long, and about 3 inches wide. Head one third of the whole length; in shape longer than a semicircle, strongly margined, with long tapering spines reaching backwards at least two thirds of the length of the thorax. Glabella occupying one third of the width of the head, and reaching forward to the anterior margin, which it partly indents; wide in front, and posteriorly, and contracted at the middle third. It is indented by five or six faint and short furrows on each side, and by a well-marked neck-furrow. Eyes near the glabella, and placed more than halfway up the head. The anterior facial sutures run obliquely outwards, above the eyes, and cut across the margin at a distance from the glabella equal to about a third of its width. The posterior sutures curve sharply backwards, and outwards, across the posterior margin, near its middle. Thoracic axis wide, about the width of the pleuræ anteriorly, but tapering gradually backwards. Pleuræ deeply grooved, with the fulcrum situated at about one third of their length from the axis; they are strongly faceted, and very slightly pointed at their extremities.

Tail semicircular, with a very broad margin; axis moderately convex, and marked by ten distinct rings. The tip is prominent, and bluntly pointed. The sides narrow, and scored by eight furrows, which are interlined, and reach to the edge of the broad margin. (In one specimen they seem partly to run across the margin.) The margin is concentrically striate, about equally wide throughout, and raised on the inner side above the level of the surface of the lobes. Labrum long, and slightly pointed, with a strong concentric furrow near the posterior margin; the margin is wide, and indented by a pair of furrows near the tip. Width, equal to about two thirds of the length. Front much arched and about equal in width to the posterior portion.

This magnificent species is considerably larger than the *Niobe Homfrayi*, which occurs in North Wales, and differs from it in many particulars, though not sufficiently so to form a new genus. *Niobe*

Homfrayi has no spines at the angles, nor has it a strong margin to the head. The positions of the anterior and posterior ocular furrows are different in the two species; and the tail in the *Niobe Homfrayi* also has a less number of furrows, both on the axis and the lobes. The labrum, too, is wider, and has a better-defined margin.

Loc. Ramsey Island, and Tremanhire, St. David's.

NIOBE SOLVENSIS, spec. nov. Pl. IV. figs. 10–16.

This is a small species, from an inch to an inch and a half in length. General shape a broad oval. Head semicircular, with posterior spines reaching backwards to about one half of the length of the thorax. Margin throughout strong, and wide at the sides, but narrowing anteriorly opposite the glabella. Glabella occupying a third of the width of the head, widest anteriorly; grooved by four or five short and faint lateral furrows, and a neck furrow. Eyes situated halfway up the head, semilunar in shape, prominent, and tolerably large. Anterior facial sutures running obliquely forwards, in front of the eyes, and the posterior backwards to cut across the hinder margin about half the distance across from the glabella to the outer edge. Body-axis broad, equally wide throughout, and moderately arched. Pleuræ as long as the width of the axis, deeply grooved, and with the fulcrum situated about a third of the distance across from the axis in the anterior ones, but further out in the hinder ones: all bluntly pointed at the ends.

Tail semicircular, with a strong margin equally wide throughout; axis well raised, tapering quickly towards the extremity, which is bluntly pointed and prominent over the inner edge of the margin, and marked by ten distinct rings. Lateral lobes wide, and marked by from six to eight ribs, the anterior ones being deep, and the hinder ones faint.

This is a much smaller and wider form than the *Niobe menapiensis*, and is easily distinguished from it by its wide thoracic axis, which is equally broad throughout, and by the wide lateral lobes of the tail. The eyes are also nearer the middle of the length of the head, and larger in proportion to the size of the species.

Loc. Ramsey Island, and Tremanhire, St. David's.

CTENODONTA MENAPIENSIS, Hicks. Pl. V. figs. 6 & 7.

C. rotunda, Hicks, Cambridge Catalogue.

Ovate in form, $\frac{1}{4}$ of an inch long by about $\frac{3}{16}$ wide. Valves well raised, beak prominent and pointed, and placed nearer to the anterior margin. Surface marked by fine concentric lines, and ventral margin fimbriated. Both ends of the shell rounded, posterior most; muscular scars strong; teeth prominent.

Loc. Ramsey Island and Tremanhire.

CTENODONTA CAMBRIENSIS, Hicks. Pl. V. figs. 8 & 9.

C. elongata, Hicks, Cambridge Catalogue.

Ovate in form, but nearly equilateral, with the umbo situated almost midway between the extremities; $\frac{3}{8}$ of an inch long and rather more than $\frac{1}{8}$ in width. Shell regularly convex, and marked

by strong lines of growth near the pallial margin. Muscular scars moderately strong, the anterior being most distinct. Teeth not so prominent as in *C. menapiensis*, from which species it is at once distinguished by its subcentral umbo and nearly equilateral sides.

Loc. Ramsey Island and Tremanhire.

PALÆARCA HOPKINSONI, spec. nov. Pl. V. fig. 11.

Oval in form, half an inch in length, and width rather more than half the length. Hinge-line less than a third of the length. Shell convex near the beak, but flattened and spread out anteriorly. The beak does not reach quite to the cardinal margin, and is placed nearer the anterior end. Muscular scars well shown, and lines of growth tolerably distinct.

Loc. Found by Mr. J. Hopkinson, F.G.S. (after whom I have the pleasure of naming it), at Ramsey Island and St. David's.

PALÆARCA OBOLOIDEA, spec. nov. Pl. V. fig. 10.

Rather over a third of an inch long and nearly as broad at the widest part. Strongly convex, except near the posterior extremity, where it suddenly becomes flattened. Beak subcentral, nearer anterior extremity, and overhanging cardinal margin. Surface marked with strong lines of growth. In its subcentral beak and oboloid outline it differs materially from *P. Hopkinsoni*.

Loc. Ramsey Island and St. David's.

GLYPTARCA, gen. nov.

Inequilateral and strongly ventricose. Beak near anterior end, prominent, overhanging more or less the hinge-line, and pointed at the extremity. Two diverging ridges extend from the umbo to the margin, and enclose a triangular sulcus having its base at the margin, which it thereby indents. Anterior muscular impression strong, posterior less distinct. Hinge-area narrow, plate thick, with three teeth in front of the umbo. Surface strongly marked (especially near pallial margin) with concentric lines of growth. The strong diverging ridges and deep sulcus indenting the pallial margin, along with the very narrow hinge and raised and strongly produced beak, form the chief characters of this genus, and distinguish it at once from all known Silurian genera.

GLYPTARCA PRIMÆVA, spec. nov. Pl. V. figs. 1–4.

Pear-shaped, $\frac{1}{4}$ of an inch long and about $\frac{1}{8}$ wide. Anterior extremity short, posterior long and tapering, beak prominent. Surface deeply grooved from beak to pallial margin, which is strongly indented. Lines of growth strong. Muscular scars well marked.

Loc. Ramsey Island and Tremanhire, being very plentiful at both places.

GLYPTARCA LOBLEYI, spec. nov. Pl. V. fig. 5.

Much larger than *G. primæva*, and it is also wider at the posterior extremity. Half an inch long and about $\frac{3}{8}$ wide. Hinge-margin

very narrow. Sulcus well defined, but not as deep as in *G. primæva*, pallial margin indented, anterior and posterior edge rounded. Beak prominent, and general surface well raised. Concentric lines of growth shown, but not very strong.

I have named this species after Mr. J. Logan Lobley, F.G.S., whose tabulations of this and other classes of the Mollusca form important contributions to palæontology.

Loc. Ramsey Island and St. David's.

DAVIDIA, gen. nov.

Ovate, umbo subcentral, nearer anterior extremity, both extremities nearly equal in width. Surface of shell raised, and almost ridged between umbo and each end near the cardinal margin. Hinge-line more or less straight, about a third of the length of the shell, and extending equally on each side of the umbo. Lines of growth strongly marked.

The subcentral umbo, equal extremities, and almost triangular shape of the shell are important characters, and sufficient to stamp it a new genus.

DAVIDIA ORNATA, spec. nov. Pl. V. fig. 12.

Ovate, $\frac{7}{8}$ of an inch long and rather less than $\frac{3}{8}$ wide; beak raised, with a strong ridge extending from it to each extremity. Surface of shell marked with very strong lines of growth, posterior surface in addition covered by transverse striæ, converging obliquely from margin to umbo. Hinge-line straight.

Loc. Ramsey Island and St. David's.

DAVIDIA PLANA, spec. nov. Pl. V. fig. 13.

Ovate, nearly an inch long, and rather less than half an inch wide, both extremities abruptly rounded. Beak pointed and slightly incurved. Shell evenly but strongly raised in a line from the umbo to the extremities. Hinge-line slightly convex. Lines of growth marked but not very strong. This species differs from *D. ornata* in having a less straight hinge-line, less strong lines of growth, and in the want of the transverse striæ on the posterior surface.

Loc. Ramsey Island and St. David's.

MODIOLOPSIS RAMSEYENSIS, spec. nov. Pl. V. fig. 14.

Ovate in form, over an inch long by rather less than half an inch wide. Strongly raised along hinge-margin, and inflated. Anterior extremity short and rounded obtusely; posterior long and pointed. Beak incurved; pallial margin strongly convex. Hinge-line long. Surface covered by concentric lines of growth.

Loc. Ramsey Island and Tremanhire.

MODIOLOPSIS HOMFRAYI, spec. nov. Pl. V. figs. 16 & 17.

Ovate, greatly elongated, over an inch in length by about a fourth of an inch in width. Anterior extremity short and rounded; posterior

end long, and narrowing gradually towards the extremity, which is also rounded. A moderately strong ridge strikes off from the umbo towards the posterior margin, but diminishes in strength gradually as it approaches it. Beak depressed. Hinge-line long and straight. Surface rounded and faintly marked with lines of growth, pallial margin gently curved.

Differs from *M. ramseyensis*, which it most nearly approaches, in being much narrower, less convex, and in having the posterior extremity evenly rounded.

Loc. Ramsey Island and Tremanhire.

MODIOLOPSIS SOLVENSIS, spec. nov. Pl. V. figs. 18 & 19.

Rhomboid oval, less than half an inch long by about $\frac{3}{16}$ wide. Anterior extremity short; posterior long. A very strong ridge extends from umbo to posterior margin, and another nearly equally strong to anterior margin. Posterior edge rounded; anterior angular. Hinge-line long and straight. Shell nearly equally wide, excepting near its posterior extremity, and strongly raised along the line of the ridges. Muscular scars large and distinct. This species differs from the others in its rhomboidal shape and angular ridges.

Loc. Ramsey Island, Tremanhire near Solva, and St. David's.

MODIOLOPSIS CAMBRIENSIS, spec. nov. Pl. V. fig. 20.

Nearly oval, $\frac{3}{4}$ of an inch long, and about $\frac{3}{8}$ wide. Both extremities almost equally rounded. Beak nearer anterior margin, tolerably well raised and pointed, surface ridged from beak to posterior margin. Shell compressed. Lines of growth perceptible near margin. More oval in shape, and hinge-line shorter than in the other species.

Loc. Ramsey Island.

BELLEROPHON SOLVENSIS, spec. nov. Pl. III. fig. 33.

A small species, of three very gradually increasing whorls, about $\frac{1}{8}$ of an inch in diameter. Surface smooth, sides inflated. Only one specimen has been found; but this is sufficient to show that the species is new and distinct from any hitherto found in rocks of this age.

Loc. Tremanhire near Solva, and St. David's.

BELLEROPHON RAMSEYENSIS, spec. nov. Pl. III. figs. 30–32.

Broad, involute, with the outer whorl greatly expanded, and ridged on the back; $\frac{1}{4}$ of an inch in diameter. Surface smooth.

Loc. Ramsey Island and St. David's.

THECA DAVIDII, spec. nov. Pl. III. figs. 28 & 29.

Elongated and compressed. Two inches and a quarter long, and a fourth of an inch wide at the mouth. Surface marked with strong transverse lines, very slightly arched.

Loc. Ramsey Island and St. David's.

ORTHOCERAS, sp. Pl. III. fig. 27.

The only specimen found is not sufficiently perfect to warrant a description, or the giving of a specific name.

Loc. Tremanhire near Solva, and St. David's.

PALASTERINA RAMSEYENSIS, spec. nov. Pl. IV. figs. 21–23.

This interesting species, the earliest starfish yet discovered in this country, was found by Mr. Lightbody of Ludlow, during our recent researches at Ramsey Island*. An inch in diameter; rays five, acute at the extremities, and enlarging gradually to about a fourth of an inch in width near the disk. Ambulacral grooves narrow, and bordered on each side by three rows of plates. The plates are closely fitted together, strongly raised; and the outer ones support some tolerably strong spines. The disk comprises about a third of the width, and is furnished throughout with strong plates. The specimens are much distorted; but they show the upper and under surfaces, and enable us to distinguish the most important characters. The length of the rays, the spines along the rays, and the comparatively narrow disk prove it to be distinct from any species hitherto published.

Loc. Ramsey Island and St. David's.

DENDROCRINUS CAMBRIENSIS, spec. nov. Pl. IV. figs. 17–20.

This species occurs moderately plentifully, but the specimens hitherto found are rather imperfect. I have referred it to the genus *Dendrocrinus*, as it appears to approach nearer to that than to any other genus.

Cup small, but rather wide at the base. Arms very long and many times subdivided, with a considerable distance placed between each bifurcation. The column pentagonal throughout, with strongly raised rounded edges, and enlarging gradually up to the base of the cup. Joints thin, but rather irregular in thickness.

Loc. Ramsey Island and St. David's.

EXPLANATION OF PLATES III.–V.

(Illustrative of Fossils from the Tremadoc Rocks of St. David's.)

PLATE III.

Fig. 1. *Neseuretus elongatus*, gen. et spec. nov. From Ramsey Island and St David's (collection of Mr. Lightbody).
2, 3. —— ——. From Tremanhire, St. David's (the author's collection).
4. —— ——, var. *obesus*. Ramsey Island (ditto).
5, 6. —— *recurvatus*, spec. nov. Ramsey Island and Tremanhire (ditto).
7–10. —— *ramseyensis*, spec. nov. Ditto (in Mr. Homfray's and the author's collections).
11–13. —— *quadratus*, spec. nov. Ramsey Island (ditto).
14, 15. ——, free cheeks. Ditto (the author's collection).
16. —— *ramseyensis*, body and tail of. Ditto (ditto).

* Dr. Otto Torell and Mr. Linnarson had described forms of starfish which had been found in Sweden, in rocks supposed to be of the age of the Harlech group of Great Britain.

Fig. 17. *Neseuretus ramseyensis*, section showing convexity of thorax.
18–26. ——, tails of several species. Ramsey Island and Tremanhire (collections of Messrs. Homfray, Lightbody, and Hicks).
27. *Orthoceras*, sp. Tremanhire (the author's collection).
28, 29. *Theca Davidii*, spec. nov. Ramsey Island (ditto).
30–32. *Bellerophon ramseyensis*, spec. nov. Ramsey Island and Tremanhire (ditto).
33. —— *solvensis*, spec. nov. Tremanhire (ditto).

PLATE IV.

Figs. 1–9. *Niobe menapiensis*, spec. nov. From Ramsey Island and Tremanhire (collections of Messrs. Homfray, Lightbody, and Hicks).
10–16. —— *solvensis*, spec. nov. Ditto (in the author's collection).
17–20. *Dendrocrinus cambriensis*, spec. nov. Ramsey Island (in Messrs. Lightbody and Hicks's collections).
21–23. *Palasterina ramseyensis*, spec. nov. Ditto (in Mr. Lightbody's collection).

PLATE V.

Figs. 1–4. *Glyptarca primæva*, gen. et spec. nov. Ramsey Island (in the author's collection).
5. —— *Lobleyi*, spec. nov. Ditto (ditto).
6, 7. *Ctenodonta menapiensis*, spec. nov. Ditto (ditto).
8, 9. —— *cambriensis*, spec. nov. Ditto (ditto).
10. *Palæarca oboloidea*, spec. nov. Ditto (ditto).
11. —— *Hopkinsoni*, spec. nov. Ditto (in Mr. Hopkinson's collection).
12. *Davidia ornata*, gen. et spec. nov. Ditto (in the author's collection).
13. —— *plana*, spec. nov. Ditto (in Mr. Lightbody's collection).
14. *Modiolopsis ramseyensis*, spec. nov. Ditto (the author's collection).
15. —— —— (?). Ditto (ditto).
16, 17. —— *Homfrayi*, spec. nov. Ditto (collection of Messrs. Hopkinson and Hicks).
18, 19. —— *solvensis*, spec. nov. Ditto (the author's collection).
20. —— *cambriensis*, spec. nov. Ditto (ditto).

DISCUSSION.

Mr. LOBLEY commented on the importance of the discovery of so many well-marked species of Lamellibranchiata in beds of an earlier date than those in which their presence had previously been known.

Mr. H. WOODWARD agreed with the author in regarding the *Neseureti* and *Niobæ* described as presenting new forms.

Mr. HOPKINSON remarked on the similarity of the faunas of the Tremadoc and Arenig rocks to those of the Potsdam and Quebec rocks of America. With regard to the connexion between the Arenig and Llandeilo beds, he mentioned that but one or two forms of Graptolites passed from one to the other. It was, however, between the Tremadoc and Arenig rocks, if anywhere, that there appeared to be a distinct break in the series.

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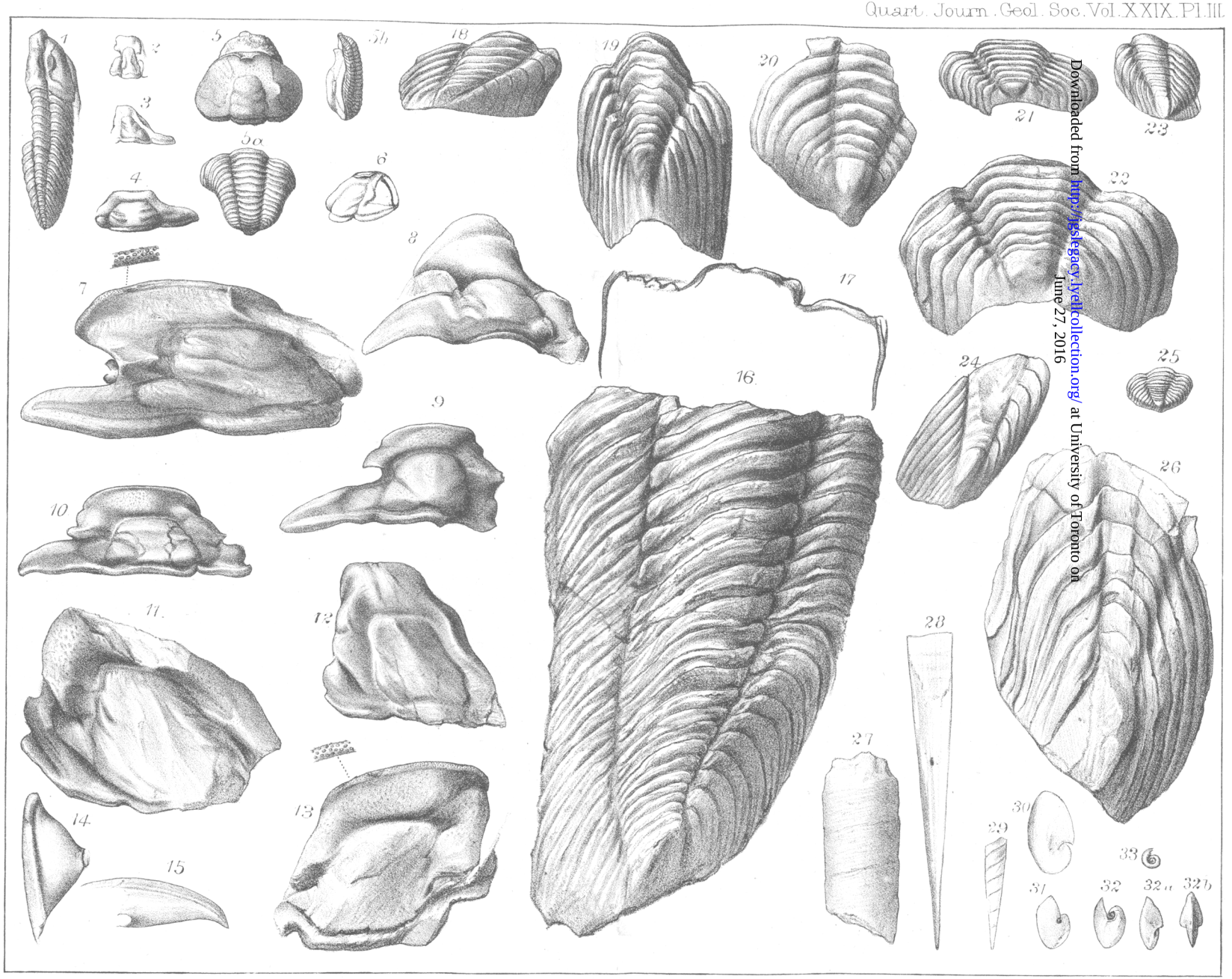
2. *On the* PHOSPHATIC NODULES *of the* CRETACEOUS ROCK *of* CAMBRIDGESHIRE. By the Rev. O. FISHER, F.G.S.

[PLATE VI.]

ON the twenty-second of January 1868, during the discussion upon Mr. Judd's paper on the Speeton Clay, I was much struck with an



C.L. Griesbach. Cl.Ford.

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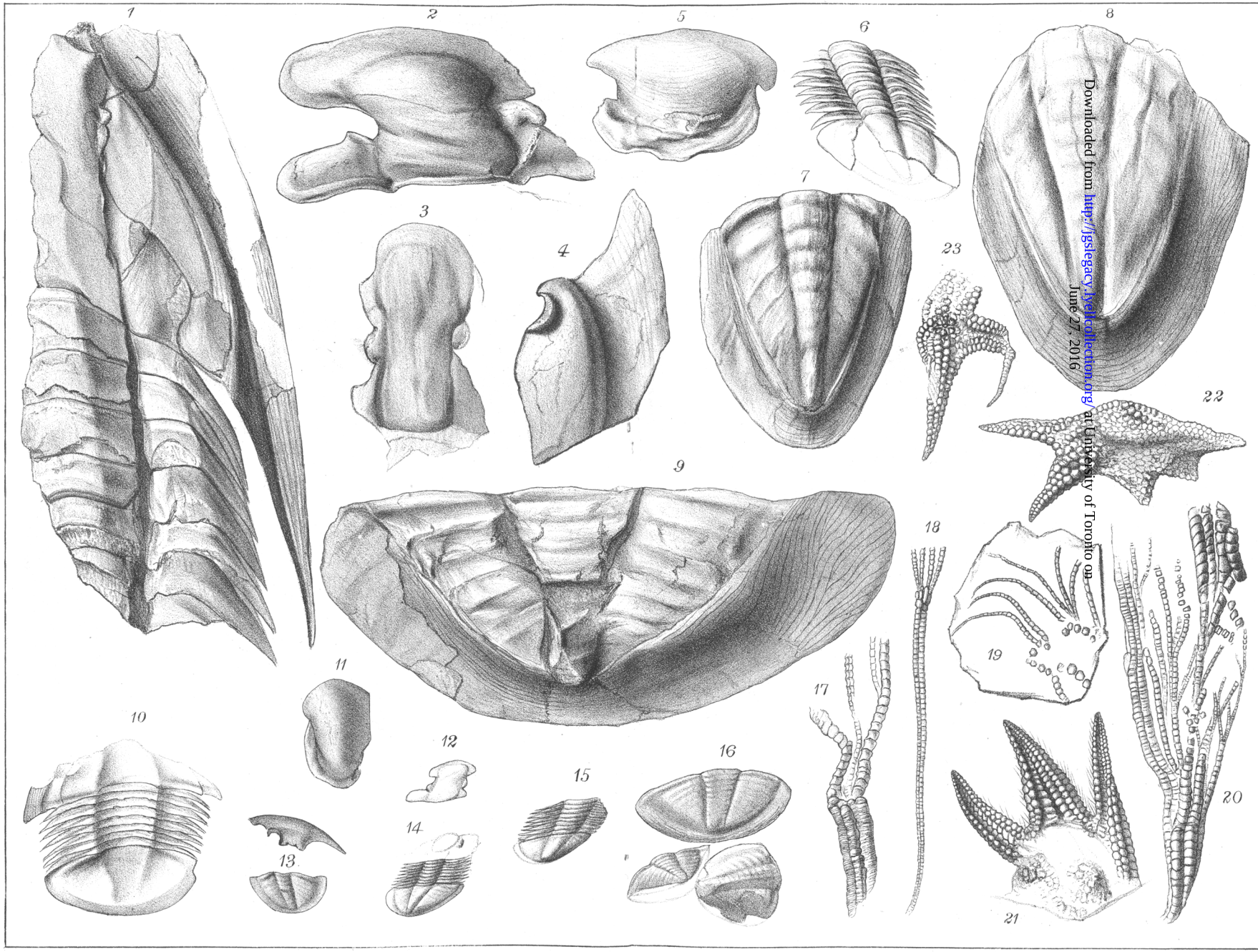
TREMADOC FOSSILS OF St DAVID'S



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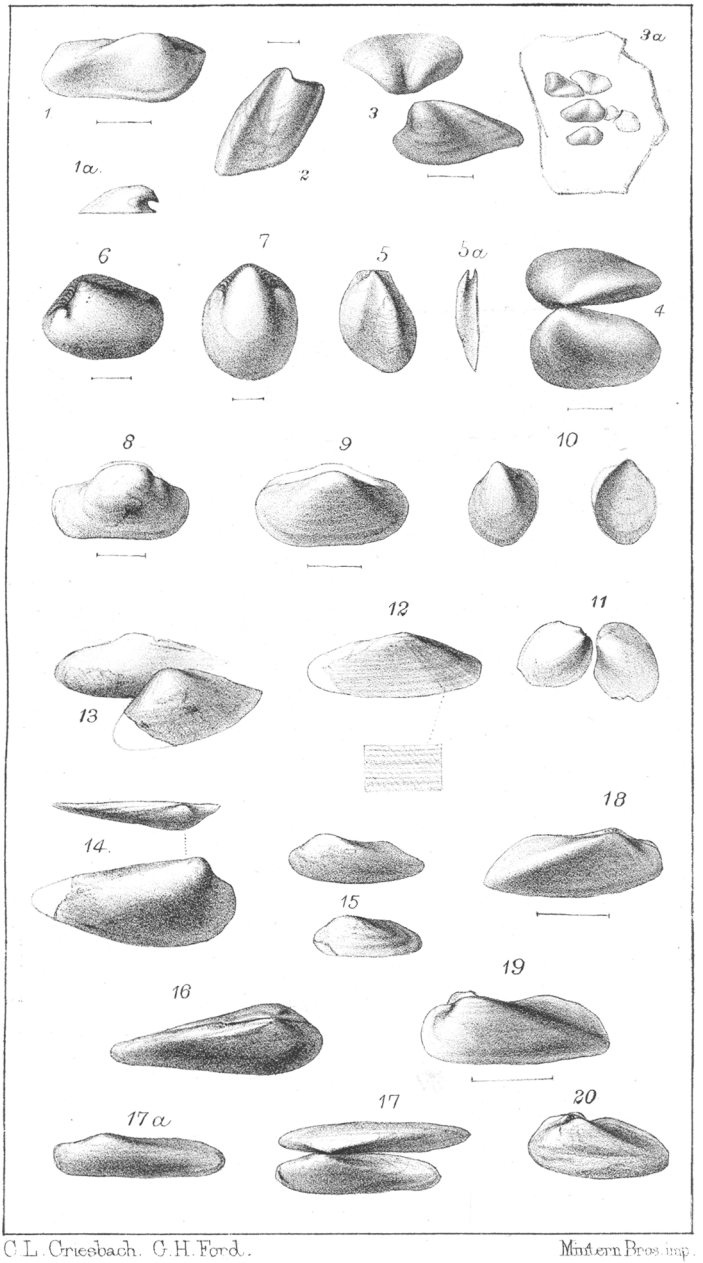

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