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ARTICLE VII.—*Notice of some new species of Primordial Fossils in the Collections of the Museum, and corrections of previously described species.* By R. P. WHITFIELD.

ARTICLE VIII.—*Geological Sections across New Hampshire and Vermont.* By C. H. HITCHCOCK.

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ARTICLE VII.—*Notice of some new species of Primordial Fossils in the Collections of the Museum, and corrections of previously described species.* By R. P. WHITFIELD.

Several of the fossils noticed in this paper were donated to the Museum by Prof. Jules Marcou, of Cambridge, Mass., in whose possession they have been for many years, having been collected by himself during his visits to the localities from which they were obtained, many years ago.

Others were obtained from Prof. C. H. Hitchcock, in exchange; and those from the Potsdam sandstone of the Ausable Chasm at Keesville, N. Y., were collected by the writer in the autumn of 1880. Of the species of *Olenellus* previously described, the specimens now in the collection present additional features in the direction of the original description, by the author of the species, or variations from these features to so great an extent, that it appears desirable that these should be illustrated and described. More especially is this the case as both the original types and the more recently obtained examples are placed side by side in the Collections of the Museum.

As an excuse for publishing the other new material presented, I might remark, that any new material, however meagre, from the primordial zone of the New York rocks, or those immediately adjoining, appears of the utmost importance, in the light of the recent discussions which have taken place concerning the synchronism of the Western Potsdam with that of New York and other Atlantic border localities. It appears to me, that until we know more palæontologically of the New York Potsdam, it is entirely premature to refer it to a different geological horizon from that of either of the other Atlantic regions, or the Western areas. To be sure we have the *Paradoxides* type of trilobite in the Massachusetts and New Brunswick localities, in which respect they differ from those of New York or Wisconsin; but, I think, too much stress has been laid upon this fact. The existence of a given type of life at, or its absence from a certain region, where the conditions of life have been conspicuously different, may have depended more on those conditions than upon a difference in time, and so far as I am aware, the occurrence of *Paradoxides* is almost entirely confined

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to shaly or limestone formations, and is seldom or never noticed in sandstone deposits like those of the New York or Wisconsin Potsdam. This, I think, is a circumstance which has not been sufficiently considered in the assignment of the several regions to geological horizons.

If we leave out of the question the occurrence of *Paradoxides* from the fauna of the New Brunswick area, for instance, we shall find that its facies will be no older than that of the Wisconsin lower beds, for the same type of *Conocephalites* occurs in each; and, if we consider the Brachiopods, especially the occurrence of *Orthis Billingsi* and *Discina Acadica*, Hartt, both of which would be much newer in type than any forms known to exist in the fauna of Wisconsin. But about the existence of *Discina* I am greatly in doubt. An example referred to *D. Acadica*, received from Mr. G. F. Matthews, I believe to be only the imprint of a univalve shell, either of the genus *Palæacmaea* or *Stenotheca*. It certainly is not a *Discina*. This would still further show the relations of the New Brunswick beds with the New York and Wisconsin localities, as both of those genera are known from the former, and *Palæacmaea* from the latter. The occurrence of *Orthisina orientalis* herein described, at the Georgia, Vt., locality—which species is so close a representative of *Orthisini pepina*, Hall, from the Trem-paleau, Wis., and Lake Pepin, Minn., beds, that I am not sure but that I err in giving it a distinct name—still further connects these Atlantic areas with the Western ones. My own impression, at the present time is, that the New York typical Potsdam is about equivalent to the lower portion of the Wisconsin areas, and that the Acadian beds of Canada and Vermont, and perhaps the other Atlantic areas, are not appreciably different in age, but that the difference in faunæ is more the result of conditions upon which life depended than a difference in time. I am also of the opinion, that much of the so-called Quebec of Canada, and especially the lower limestones at Point Lévis, are typical Potsdam. At least, if the trilobitic fauna of these limestones were shown me, without a knowledge of their locality, I should unhesitatingly pronounce them Potsdam. It may be, that at some of the localities, the shales bearing *Paradoxides*-like trilobites may be overlaid by sandstones; but have we anywhere this succession,

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at any one locality, where the rocks bear the respective faunæ which have been supposed to be characteristic of the two distinct epochs? Until such can be shown to be the case, with some evidence of a physical break representing a lapse of considerable time, I can see no absolute reason for assigning the sandstone to a different geological epoch from that which is assigned to the shales, simply because one contains a single form of life which may not have been suited to the conditions which existed during the formation of the deposit.

Genus *LINGULEPIS*, *Hall*.

***Lingulepis minima*, n. sp.; Plate 14, Figs. 1 and 2.**

Shell small but slightly exceeding one-fourth of an inch in length measured on the ventral valve of the largest examples seen. Cuneiform in outline, less than two-thirds as wide below as the entire length, attenuated and elongated at the beak on the ventral side, and elongate-ovate on the dorsal side. Lateral margins of the ventral valve regularly diverging and direct, while the basal or front margin is broadly rounded with subangular lateral angles. Dorsal valve shorter than the ventral and more rapidly diverging in the upper part. Disc of the valves convex, the ventral side becoming angularly so in the narrower portions, while the dorsal is most convex near the umbone; surface smooth or semi-polished when perfect, and marked by very fine concentric lines of growth, and in the partially exfoliated condition, the usual state, they show strong radii.

This is a small species, and so far as I am aware, the smallest of the genus described from this country. It will be readily recognized by the sharply wedge-form outline, and the broadly-rounded front margin. The species most nearly related to it is *L. cuneolus*, Whitf., from the Potsdam sandstone of the Black Hills (see Geol. Black Hills of Dakota, p. 336, pl. 2, fig. 5 and 6), from which it differs in its more attenuated form, straight lateral margins and less rounded front.

Formation and locality.—In the Potsdam sandstone at the Chasm near Keesville, N. Y., where it occurs associated with *Conocephalites verrucosus*, herein described.

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Genus OBOLELLA, Billings.

Obolella prima, Conrad sp. ; **Plate 14, Figs. 3-5.**

Lingula prima (Conrad), Hall; *Pal. N. Y.*, Vol 1, p. 3, pl. 1, fig. 2.

Lingula ovata (Emmons); *Geol. Rpt. 2d Dist. N. Y.* p. 105.

Lingula prima (Emmons); *Am. Geol. Vol.* 1, p. 202.

Lingulepis prima (Conrad); Miller; *Cat. Pal. Fossils*, p. 115.

Obolella nitida (Ford); *Am. Jour. Sci.* 1873, p. 213.

Obolella? polita (Hall); 16th Rept. N. Y. State Cab. p. 133,
pl. 6, figs. 17-22.

The shells of this species as found in the Potsdam sandstone at the Ausable Chasm, near Keesville, N. Y., are usually in a very poor state of preservation, and do not afford very good means of comparison with other species. The matrix in which they are preserved is a hard quartz sandstone, with a silicious cement, which does not separate readily from the shell, but causes a complete exfoliation of the surface when broken; moreover, the grains of sand have usually left their imprint on the shells so as to further obscure their form. During a visit to the Chasm in 1880, I obtained shells preserved in a much better condition than are those in the well-known *Lingula* bed at the foot of the Cathedral rocks. In this layer, although the specimens are somewhat smaller in size, the shell is often perfectly preserved and possesses a high polish on its surface and are in a good condition for comparison with other species. In making comparisons between the New York form and *Obolella polita* of the Wisconsin rocks, I can find not the least particle of difference between individuals of the same size. In size, form, convexity, structure of surface, and all other external characteristics, they present precisely the same aspect, except in the condition of preservation, which of course has no bearing on specific relationship. Therefore, I unhesitatingly pronounce them one and the same species.

I have long been under the impression that *Obolella chromatica*, Billings, from the Potsdam horizon in Canada, would prove to be identical with the New York species, if we should obtain the latter in an available condition for comparison. I therefore applied to Mr. J. F. Whiteaves, of the Geol. Survey of Canada, for the loan of authentic specimens of that species, and of *O. Ida*, of the

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Quebec group. *Obolella chromatica* proves to be distinct, as the specimens show features which the figures do not, and features which do not exist on any of the individuals of *O. prima* which I have seen, namely, a truncation or straightening of the basal or front margin, and a broad, shallow depression of the median portion of each valve; the New York examples of *O. prima* being regularly convex on the surface in the lower part, with a regularly rounded front margin. *O. chromatica*, as preserved in the Canadian limestones, presents a dull surface, not polished like the New York species, or those from Trempealeau, Wis., when in a perfect state of preservation. In comparing the original of *Obolella Ida*, Billings, there appears to be no distinction between them. The specimen used is slightly exfoliated, but in form, convexity and general appearance, there is no difference; and, so far as the shells themselves are concerned, they might with perfect propriety be considered as of the same species. The only objection being the supposed difference in geological position. Mr. Billings says, under the description of this species, that it occurs in limestones Nos. 1 and 3 of the Quebec group, at Point Lévis, Canada; while on p. 862 of the Geol. Report of Canada for 1863, it is assigned to limestones 3 and 4. It is my impression, however, that the true stratigraphical relations of these limestones is not satisfactorily determined, if we judge by their fossil contents. If we look at the illustrations of the trilobites credited to limestone No. 3 of the Point Lévis section, on the page of the work cited above, one cannot fail to be impressed with their primordial aspect, and if I were shown such trilobites from any other locality, I should not hesitate to pronounce them as from the Potsdam horizon. This primordial aspect of these beds has been fully recognized in the above-mentioned report on p. 293.

In comparing these Ausable specimens with specimens from the limestones at Troy, N. Y., identified by Mr. S. W. Ford as his *Obolella nitida*, I find there is a very close resemblance. It may be that the examples referred to are wrongly identified, but they were determined by himself. The examples do not accord very well with the description, as they are as long as wide, or even a little longer than wide, and appear ovate instead of "transversely sub-oval," and there is no appearance of a hinge line which is
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"apparently equal to about one-third the width of the shell," which would be a somewhat anomalous feature for a shell of this genus. The shells in question scarcely differ in any respect, not even in size, from those in the sandstone, and I see no reason whatever for considering them as distinct.

Genus ORTHISINA, *D'Orb.*

Orthisina orientalis, n. sp.; **Plate 14, Fig. 6.**

Shell quadrangular in outline, somewhat higher than wide, with vertical and sub-parallel lateral margins, and broadly rounded base. Cardinal line rapidly sloping from the apex to the extremities, which are slightly rounded. Hinge line straight, as long as the greatest width of the shell. Cardinal area broad and high, divided in the middle by a triangular foramen which is about as high as wide. Surface of the ventral valve moderately convex, marked by very fine radiating striæ and also by several concentric lines of growth. Filling of the rostral cavity and foramen large and prominent. Specimen, a cast in shale, of the ventral valve only.

This species is very closely allied to, and may possibly be identical with *Orthisina Pepina* (*Orthis pepina*, Hall) from the Potsdam sandstones at Kickapoo and Trempealeau, Wis., and Lake Pepin, Minn. The present example described is somewhat larger than any specimen which I have seen from the Western localities, and is more finely striated. The specimen is preserved in a partially metamorphosed shale, and has undergone some compression so as to render it less ventricose than it probably was during life.

Formation and locality.—From the shales holding *Olenellus Thompsoni*, Parker's farm, West Georgia, Vt. Collected and presented to the Museum by Prof. Jules Marcou.

Genus NOTHOZOE, *Barrande.*

Nothozoe Vermontana, n. sp.; **Plate 14, Figs. 14 and 15.**

In some white sandstone of the Potsdam, associated with *Hyo-lithes gibbosus*, H. & W., are great numbers of elliptical or oval bodies which are irregularly convex on the surface, varying from an eighth of an inch to fully three-fourths of an inch in length and about three-fifths as wide as long. The specimens are all

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internal casts or impressions, and have a highly ferruginous appearance when on a freshly broken surface of the rock. They are usually a little more convex at one end, and along one side of a median line than on other parts, and present much the appearance of an overgrown *Leperditia*. These bodies I have supposed to be the remains of a bivalve crustacean, as they correspond quite closely with figures of species of the genus *Nothozoe*, Barrande. I therefore propose to class them under that genus, with the specific name *Vermontana*, with the following diagnosis:

Cast of carapace valves oval or ovate, convex on the surface, most convex near one end and along one side, midway between the margin and the median line. Surface features not definitely known, but probably radiately striate, from the most convex part outward.

On a weathered surface, where there are numbers of the impressions, there are faint indications of fine radiating striations as distinct as could be expected when preserved in a coarse sandstone or quartzite matrix. The striations are hair-like and appear to diverge from the most convex portions across the valves. Neither margin is straight, although one side often appears straighter than the other, though it is not uniform with the convex parts. No tubercles or features of a like character have been observed.

In general appearance the specimens, as seen on the rock surface, resemble a group of small Lamellibranchiate shells, and would naturally be looked upon as such, and are usually arranged on the surface of the rock with their longitudinal axis parallel to each other, as would be the case with such shells under the action of a current of water.

Formation and locality.—In white sandstones of the Potsdam formation. The specimens bear labels "Highgate, Vt., C. B. Adams," but Prof. C. H. Hitchcock tells me they are from Lake Dunmore, near Middlebury, Vt., that no such rock occurs at Highgate.

Genus CONOCEPHALITES, *Zenker*.**Conocephalites verrucosus, n. sp. ; Plate 14, Figs. 9-12.**

Minute, the largest example seen indicating not more than a length of an eighth of an inch for the entire cephalic shield.

Glabella and fixed cheeks when united, subquadrate in outline and quite convex, narrowest across the front and gradually widening behind. Anterior margin rounded and bordered by a thickened projecting rim, which is wider in the middle than toward the facial sutures. Fixed cheeks moderately wide but highly convex, crossed at about their anterior third by strong, elevated, rounded ocular ridges, which are curved outward in their direction. Dorsal furrows deeply marked. Occipital ring narrow but sharply rounded. Glabella paraboloid, narrowed anteriorly but not truncate, higher than wide, highly convex and marked by three pairs of deeply impressed glabellar furrows. Occipital ring of the axial portion elevated and projected backward in form of an elevated and pointed node, or sub-spine. Middle of the frontal limb divided by a shallow depression, and the surfaces on each side raised in the middle so as to appear sub-tumid. Surface of the test entirely and closely covered with fine, raised granules, very distinct under a hand-glass of ordinary power.

Movable cheeks only partially known. The fragments observed would indicate a rather narrow plate, moderately elevated, much longer than wide, curved on the outer margin and bordered by a strong, elevated and rounded marginal rim, which is continued backwards so as to form a strong spine of unknown length at the genal angles. Surface characters as on the head.

Pygidium transversely elliptical, with acute outer angles, bordered by a narrow but very distinct marginal rim ; proportions of length and breadth about as three to five, the posterior margin more convex than the anterior. Axial lobe narrower than the lateral ones, highly convex, extending nearly to the posterior margin of the plate, marked by four distinct annulations besides the terminal one, which is confluent with the marginal rim. Lateral lobes divided into four distinct annulations, which terminate at the marginal rim, each annulation marked along the middle by a narrow depressed furrow making them double. Surface entirely covered

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by the same form of minute granules as the middle parts of the head and movable cheek.

This small *Conocephalites* is very closely allied to *C. minutus*, Bradley, and is of corresponding size. It differs somewhat in its form and proportions, especially so in the middle portions of the head, having narrower fixed cheeks and more cornical glabella. The suture line also differs somewhat, especially in being more direct behind the eye, giving a much shorter lateral limb; the frontal limb also differs, particularly in the depression at the middle line. But the most remarkable distinction consists in the roughly granulose surface. This feature is quite remarkable, as the granules are densely crowded over every part of the surface, in the depressions as well as on the elevations. The *C. minutus* does not often preserve the substance of the test, so that the actual surface is not often seen. But in impressions of it where it was preserved in a fine impalpable mud, the matrix is entirely smooth, while this one, even in cases where the matrix is more coarsely sandy than the size of the granules, the peculiar marking is readily detected, both on the glabellas and pygidia, in numerous instances.

Formation and locality.—All the specimens of the species yet known I obtained from layers of a white sandstone of the Potsdam, having ferruginous patches filled with *Lingulepis minima* and *Obolella prima*, on the high walk on the left side of the Ausable Chasm, near Keesville, N. Y., as you pass down the stream, a little below the Punch Bowl. This would bring its location fifty or more feet, I think, above the stratum which furnishes the *C. minutus*, which is near the base of Cathedral rocks in the same Chasm.

Genus ARIONELLUS, Barr.

Arionellus quadrangularis, n. sp. ; Plate 14, Fig. 8.

Known only by the glabella and fixed cheeks, which are of small size, and as united are subquadrangular in form and depressed convex. Glabella quadrangular a little narrower in front than at the occipital line, squarely truncate in front and destitute of any appearance of glabellar furrows. Dorsal furrows bounding the glabella, deeply marked. Fixed cheeks about half as wide as the glabella, moderately convex in the middle. Frontal limb about as
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wide as the fixed cheeks, convex on the surface and strongly arched on the front border; no marginal rim exists. Palpebral lobes, one of which is visible, minute and but slightly raised above the general surface of the fixed cheek adjacent. Occipital ring narrow. General surface smooth.

This species is so entirely distinct in its quadrangular glabella that there is no possibility of confounding it with any other American species of the genus.

Formation and locality.—The locality of this small trilobite, Braintree, Mass., in the paradoxides beds, makes it particularly interesting, and must be my excuse for describing a species from such very imperfect material. So far as I can ascertain it is the only species known from the beds at that locality, beyond the *Paradoxides Harlani*. I have long known of its occurrence there, but have not been able to find any record of its description at any time previously. Presented by Prof. J. Marcou.

Genus ANGELINA, *Salter*.

Angelina Hitchcocki, n. sp.; Plate 14, Fig. 13.

Body ovate in outline, largest across the base of the head, and gradually narrowing behind; distinctly trilobed longitudinally.

Head broad, semicircular in outline, being about twice as wide across the base as the extreme length from the front margin to the posterior side of the occipital ring. Glabella proportionally large, with parallel sides and rounded front. Surface convex and apparently destitute of any glabellar furrows. Frontal limb narrow in front of the glabella, and bordered by a narrow rounded rim. Fixed cheeks proportionally broad, crossed in front of the eyes by a distinct ocular ridge, which is curved and runs nearly parallel to the margin of the head. Lateral limbs large, triangular and extending nearly to the origin of the cheek spines. Eyes large, reniform, and the palpebral lobes flattened. Occipital ring narrow and divided from the glabella and fixed cheeks by a narrow groove. Movable cheeks elongate-triangular, curved on the outer margin, moderately convex over the central area, and projected backward at the postero-lateral angles in short spines. Facial suture passing a very little outward in its course from the eye to

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the anterior margin, which it cuts nearly at right angles to the border; behind the eye it passes obliquely outward and backward with a slight curvature to just within the cheek spine, forming a very broadly triangular lateral limb.

Thorax nearly once and a half as long as the head, consisting of twelve segments, and nearly twice as wide at the anterior as at the posterior end; strongly trilobed, the axial lobe forming one-third of the width anteriorly, but rapidly tapering backward; at the twelfth segment its width does not exceed one-fourth of the whole. Axial lobe convex, the segments well marked, narrow and rounded, separated by broad grooves; pleura straight, direct and flattened for nearly two-thirds of their length, from which point they are rapidly narrowed to a point, which is not recurved, but which is a little back of the central line of the rib. Surface of the pleura broadly channelled, the furrow occupying nearly the entire width of the rib, and extending to the extremity.

Pygidium small, semi-elliptical and transverse, about four times as wide as long, and marked by three furrows, both on the very small axis, and on the lateral areas. Axis terminating within the posterior margin of the plate.

Surface of the test smooth.

The generic relations of this trilobite are not exactly those given by its author to the genus *Angelina*, but they are more nearly like them than of any other described. The general form and proportions are very similar, as is also the general appearance; but in the head parts it differs principally in the possession of very distinct glabellar furrows, which is in direct opposition to the generic diagnosis, and the eyes are larger than those of the typical species. In some lights the specimen figured seems as if it had possessed two pairs of glabellar furrows, but they are so very unsatisfactorily defined, that I have chosen rather to consider them as absent. The great difference, however, is the nature of the furrows of the pleura and the pointed extremities of these parts. In the *A. Sedgwicki* the furrow is narrow at each end, and broadest and angular at the geniculation, which is near the middle of the length, while in this one the furrow is broad at the inner end of the pleura, and retains its breadth and depth for the entire length, only narrowing as the extremities of the ribs are narrowed,

while the extremities of the ribs cannot be fairly said to be bent backward to any degree. These points of difference, although considerable, I have not deemed of sufficient importance to constitute a distinct genus, rather considering that the typical species was followed too closely in the original generic description.

Formation and locality.—From the primordial slates at Georgia, Vt. Named in honor of the discoverer, Prof. C. H. Hitchcock.

Genus DIKELLOCEPHALUS, *Owen*.

Dikellocephalus? Marcoui, n. sp.; Plate 14, Fig. 7.

This species is only known, as yet, from fragments of the pygidium, but the form is so remarkable for a primordial trilobite, and so distinctive in its characters that it will be readily recognized in other specimens when found, consequently there can be no good reason why it should not be described even from the imperfect material.

The pygidium has been broadly fan-shaped, with a strong central axis and broad convex lateral lobes, form nearly semi-circular, with a moderately convex anterior margin. Axial lobe about two-thirds as wide as each lateral lobe, strongly convex, marked by about nine or possibly ten annulations (seven appearing in the fragment), the anterior three each bearing an elevated node or subspine in the middle, the fourth one having only a low node, the remainder plain. Lateral lobes divided into five or more annulations exclusive of the narrow anterior one, by deep narrow grooves or furrows, which terminate a little within the border; each annulation being marked on its surface by a faint depressed longitudinal line. Outer margin of plate bearing broad flattened spines, which are gently recurved. Five of these spines are seen on the fragment described, the last of which originates opposite the fourth segment, leaving space for two or perhaps three additional ones between it and the central line of the plate. This would give seven or possibly eight spines on each side of the plate. Surface of the plate smooth to the unassisted eye.

This is one of a group of primordial trilobite pygidia having affinity with the genus *Dikellocephalus*, *Owen*; but not properly belonging there. They have been variously placed under several

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genera, but are equally unlike any of them, and this one is more extreme in its characters than any hitherto described. It strongly reminds one of the pygidia of a group of *Dalmania* which characterize the lower Devonian of America, in the arrangement of spines around the outer margin, and is so very similar that were there any question as to its authenticity I should have been inclined to place it at that horizon.

Formation and locality.—The specimen used for description and illustration was collected by Prof. J. Marcou, from the Georgia slates on Parker's farm, near Georgia, Vermont.

Note on Olenellus Thompsoni, Hall, *Plate 15, Figs. 1-4.*

There are some features of this species which in the light of material lately obtained from Prof. Jules Marcou and from Prof. C. H. Hitchcock, would seem to need revision, and as the types of the species are in the Museum Collections it would appear only proper that the corrections should be founded upon the specimens now placed with them.

In the original figures and description the direction of the facial suture is left in doubt. This feature is usually obscure, and, in fact, in most specimens, all evidence of its existence is entirely wanting, but in one example it is easily traceable on one side of the head. In this case it cuts the anterior margin of the head on a line nearly in front of the outer edge of the palpebral lobe, passing through the rim of the head on a line parallel to the axis of the body. After passing through the rim it curves outward and then inward again to the anterior angle of the eye, forming nearly a semicircle, the curvature being nearly that of the anterior border of the glabella. Behind the eye, visible on both sides of the head, it passes outward and downward at an angle of about forty-five degrees to the base of the head to the posterior margin, forming very short, broadly-triangular lateral limbs. The glabella is very much elongated, is rounded and globuliform in front, and divided by three pairs of furrows, in front of the occipital furrow, the upper two never, and in some cases none of them, extending entirely across. The outer margin of the upper lobes are convex and partially confluent with the palpebral lobe, producing the 1884.]

features to some extent represented in the figures on page 116 of the 13th Rept. State Cab. N. Y.

The most important difference, however, noticed among the more recent collections, is the remarkable length of the pygidium, or rather caudal spine. This part of a specimen somewhat smaller than that figured in the 16th Rept. State Cab., is seen to be two and one-eighth inches long and still imperfect at the extremity, while in several other individuals it can be traced, faintly marked on the shale, to a nearly equal extent. One small individual, only two and a quarter inches across the base of the head, preserves it to a length of one and a half inches. There is not the slightest evidence of any lateral lobe or expansion, or anything analogous to this part as seen on other genera, and the median ridge shown upon the specimen figured as above referred to, does not always exist. On one specimen the fourteenth axial ring looks almost as if it might have formed an anterior lobe or ring of the telson; but in others it is seen to be distinctly separate and articulated, as are the forward axial rings to each other. This feature of the pygidium is so distinctive among all other trilobites, that it alone would serve as a generic distinction, and if the condensation of parts indicates development of organization, this form would appear to be below even paradoxides, and should precede it in age.

Among the collections mentioned above, there are several small specimens which I have been inclined to refer to *O. Vermontana*, H.; none of them, however, are quite as small as the type of that species. On a critical examination of these forms and comparison with the different sizes of *O. Thompsoni* in the Collection, I find that the distinctive features of *O. Vermontana* become less and less marked, and become merged into those of *O. Thompsoni* as the specimens increase in size, and I am inclined to think the two species represent only different stages of growth or development of one form. In the *O. Vermontana* the head is proportionately longer than in the other, and the axial lobe of the thorax supposed to be narrower, while the greater proportional width of the third thoracic segment is the most striking feature. All these features I find become less distinct with increased size, except, perhaps, the proportionate length of the head. This feature varies much at all ages. The great width of the third thoracic

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segment and its angularity at the geniculation is to me the most striking distinction between the two forms; but this is gradually lessened according to size, but is always, even in the most typical *O. Thompsoni*, a marked feature, and on a fragment presented by Prof. Marcou, which measures four and a half inches across the thorax, it is still quite marked, but no one would consider the specimen as anything other than one of *O. Thompsoni*.

On one of these small individuals above mentioned, and which shows only twelve thoracic segments, there is a suture which passes around the front of the head a little within the anterior border, which is probably a feature of the under surface (see pl. 15, fig. 3). It rises from the marginal rim of the head a short distance above the base of the cheek spine on each side and passes upward, gradually diverging from the border until it strikes the front of the glabella, where it more rapidly bends inward near the junction of the two sides, probably to unite with the hypostoma. This suture is clear and distinct, and strongly reminds one of the inner margin of the anterior plate on the under side of the head of a *Limulus*. I have not been able to find this feature on more than the one specimen. One example where the body is folded over the head, and which shows the characteristic form of the third thoracic segment of *O. Vermontana*, shows the pygidial spine to a length of more than one and a quarter inches, the specimen measuring only two and a quarter inches across the base of the head, which is very large for *O. Vermontana*, but small for *O. Thompsoni*.

Genus MACLUREA, *Lesueur*.

Maclurea Wadsworthi, n. sp.; **Plate 14, Fig. 16.**

Shell small, the example used measuring only about five-eighths of an inch in its greatest diameter, and consisting of about three volutions, the inner of which are very slightly raised above the outer ones; while the surface between the sutures is entirely flattened. Outer edge of the volutions very slightly rounded. Concave surface of shell unknown. No striæ are perceptible on the specimen.

The example is a cast in sandstone of the flat side of the shell, and the matrix of the same, preserved in such a manner that the 1884.]

concave surface is entirely concealed, consequently these features are unknown. There can be no question whatever as to its generic relations, however, as they are too well marked to leave any doubt, and it adds another genus to the already extensive fauna of the Western Potsdam.

Formation and locality.—The specimen was collected by Dr. M. E. Wadsworth, of Cambridge, Mass., from the Potsdam sandstone at Mazomanie, Wisconsin, in the summer of 1872, and by him presented to the Museum Collection.

EXPLANATION OF PLATE 14.

Lingulepis minima, Whitf. Page 141.

- Fig.* 1. An enlarged view of a ventral valve.
Fig. 2. A dorsal valve enlarged.

Obolella prima, Conrad's sp. Page 142.

- Fig.* 3. Enlarged view of a very perfect shell of this species.
Figs. 4 & 5. View natural size and enlarged of one of the original specimens used in Pal. N. Y., Vol. 1, p. 3.

Orthisina orientalis, Whitf. Page 144.

- Fig.* 6. View natural size of the type.

Dikellocephalus Marcoui, Whitf. Page 150.

- Fig.* 7. View natural size of the portion described.

Arionellus quadrangularis, Whitf. Page 147.

- Fig.* 8. Enlarged view of the glabella and fixed cheeks.

Conocephalites verrucosus, Whitf. Page 146.

- Fig.* 9. Enlarged view (six times) of a head of this species.
Fig. 10. Profile (six diameters) of another individual.
Fig. 11. Fragment of a cheek, enlarged.
Fig. 12. Pygidium, enlarged six times.

Angelina Hitchcocki, Whitf. Page 148.

- Fig.* 13. View, twice enlarged, of very complete specimen.

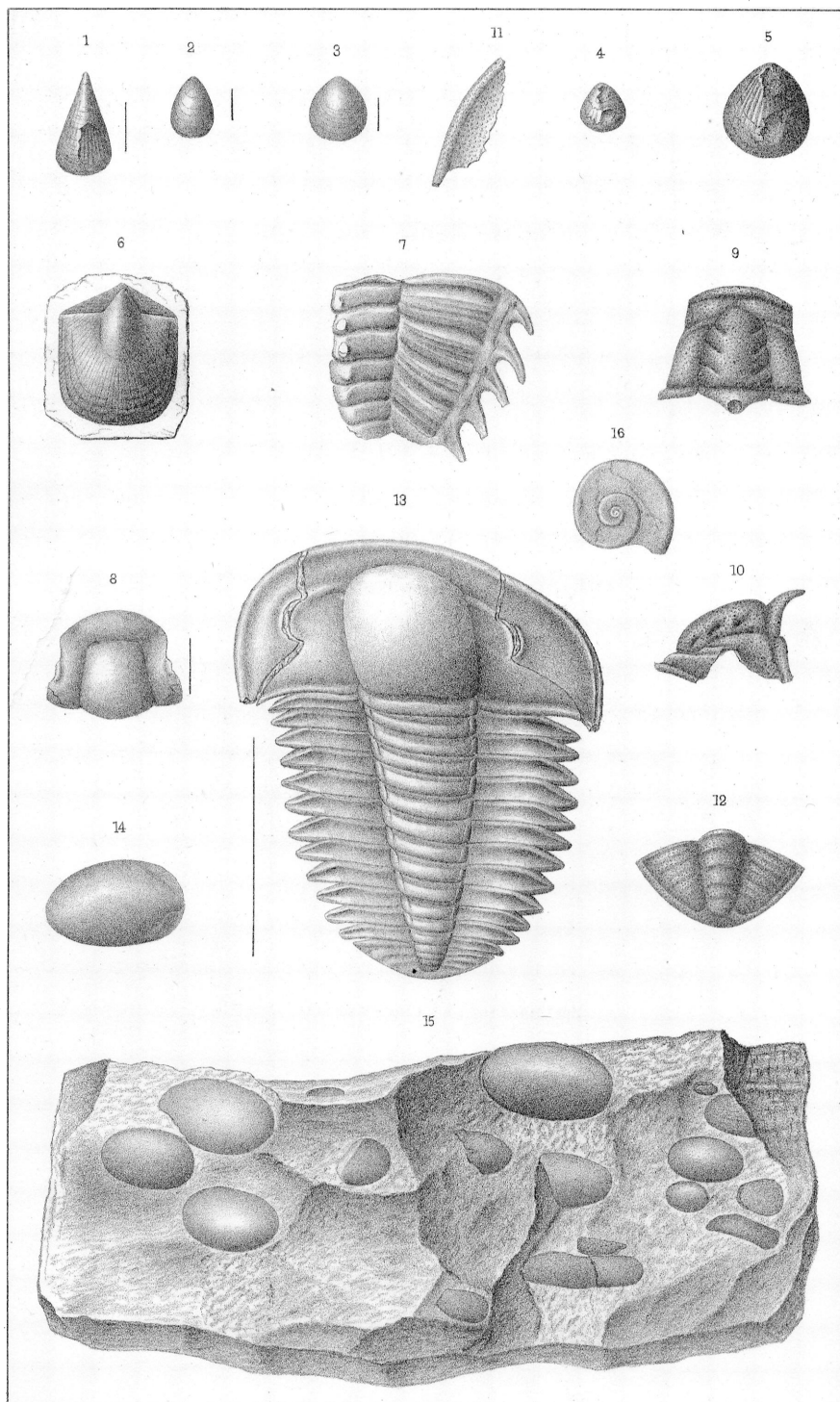
Nothozoe Vermontana, Whitf. Page 144.

- Fig.* 14. View of a large valve, natural size.
Fig. 15. View of a block of sandstone containing several individuals.

PRIMORDIAL FOSSILS.

Bulletin A.M.N.H. No. 5.

Vol. I, Plate XIV.



EXPLANATION OF PLATE 15.

Olenellus Thompsoni, Hall. Page 151.

Fig. 1. View of a specimen showing the entire form of the body and nearly the entire telson.

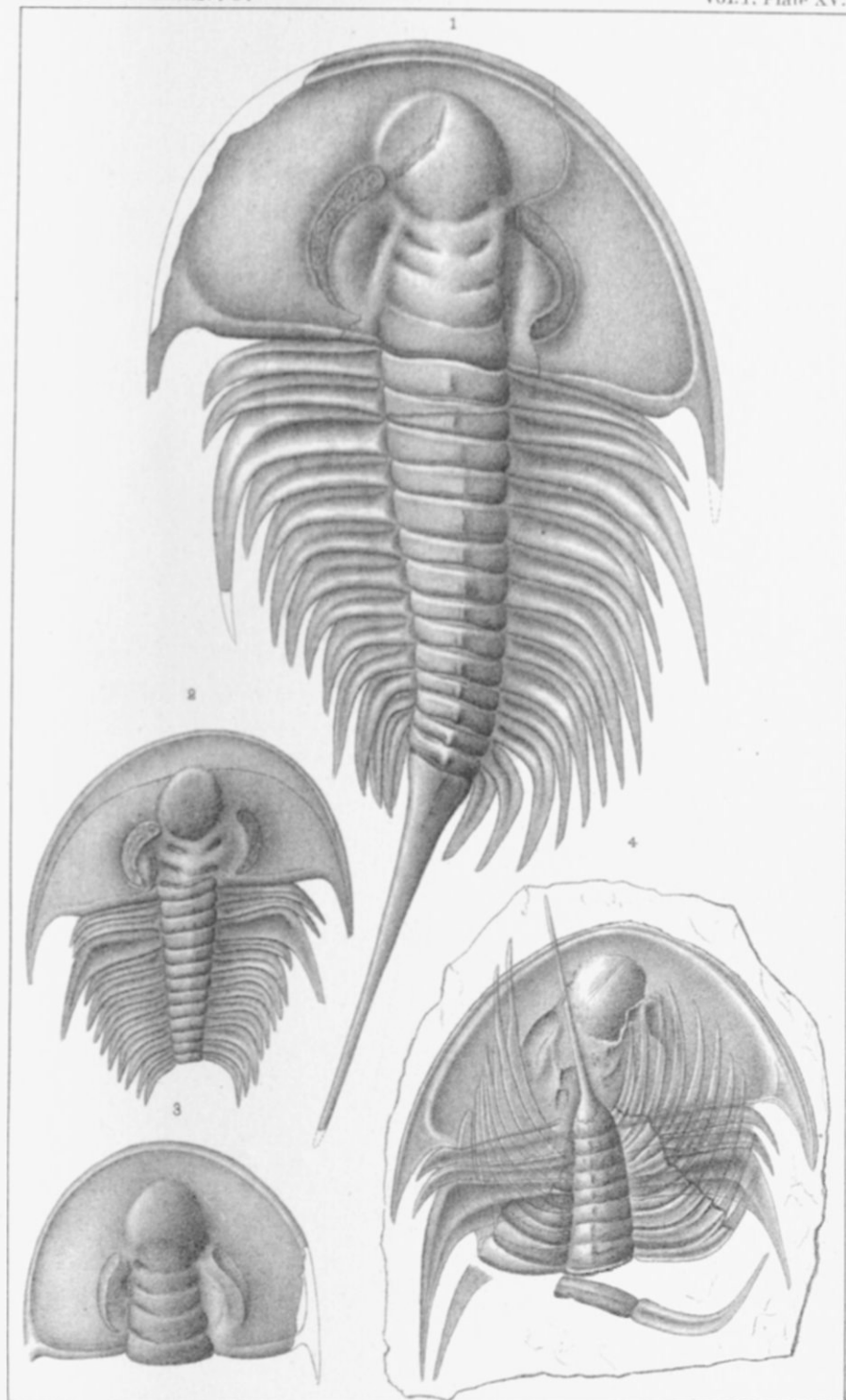
Olenellus Vermontana, Hall. Page 152.

Figs. 2-4. View of specimens of this species showing variations in form, as indicated under the remarks on *O. Thompsoni*.

PRIMORDIAL FOSSILS.

Bulletin A.M.N.H.N° 5.

Vol. I. Plate XV.



L.P. Gratacap del.