

Mr. Willis read rough minutes from his record; giving statistics relative to the remarkable weather of the first sixteen days of January, 1863, comparing the same with the weather of January for the last forty-one years.

Mr. Edward S. Morse described the anatomy of the *Margaritana arcuata*, illustrating the same with alcoholic preparations and drawings.

Mr. Henry A. Coe was elected an Acting member.

Donations announced from—E. Billings, Montreal, Essex Institute, Prof. James Hall, Albany, N. Y., Miss Fannie Winslow, Mrs. C. A. Gilson, Mrs. J. N. Merrill, H. W. Bryant, E. S. Morse, Rufus Cushman, H. Willis, Boston Soc. Nat. Hist., Prof. James D. Dana, Prof. J. W. Dawson.

The human skull, from Oregon, presented by Mrs. C. A. Gilson, was specially referred to the Committee on Ethnology for examination and a report thereon.

The skeleton of fish presented by Mr. Morse was referred for examination and report to the Committee on Ichthyology.

Description of some new species of Fossils with remarks on others already known, from the Silurian and Devonian rocks of Maine. By E. BILLINGS, F. G. S. Palæontologist, G. S. Canada.

MONTREAL, 12th Jan'y, 1863.

The following paper contains the results of such observations as I have been able to make, up to this date, on the highly interesting fossils collected by the Maine State Survey. The other specimens will be reported upon soon.

CATALOGUE OF FOSSILS FROM SQUARE LAKE.

- 1 Favosites Gothlandica, Lam.
- 2 Zaphrentis, allied to *Z. prolifica*, but probably distinct.
- 3 Diphyphyllum several fragments 3 or 4 lines thick.
- 3 Crinoid, with moniliform column.
- 5 " with a smooth round column.
- 6 Fenestella.
- 7 Incrusting Bryozoon on an Orthoceras.
- 8 Strophomena rhomboidalis, Wahlenberg.
- 9 *S. punctulifera*, Con.
- 10 *S. indenta*, Con.
- 11 *S. perplana*, Con.
- 12 *Orthis*, like *O. discus*, Hall.
- 13 *O.* a larger species of nearly the same form.
- 14 Streptorhynchus? one valve.



Fig. 1.



Fig. 2.



Fig. 4.



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 8a.



Fig. 9.

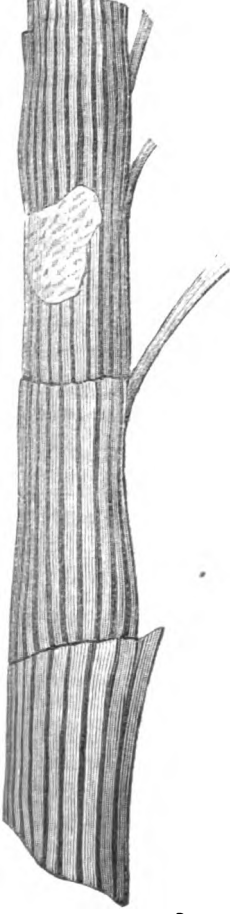


Fig. 3.

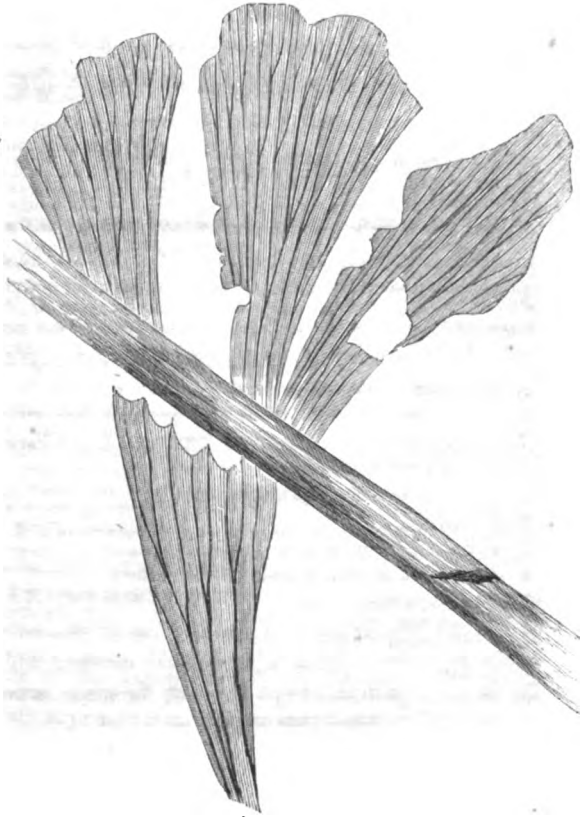


Fig. 5.

Fig. 1. *Stigmaria parvifolia*, Dawson. Fig. 2. *Lycopodites comosus*, Dawson. Fig. 3. *Anarthrocanna ferriana*, Dawson. Fig. 4. *Cordaites flexuosus*, Dawson. Fig. 5. *Cyclopteris Browniana*, Dawson. Figs. 6 and 7. *Cyclopteris Rogersi*, Dawson. Fig. 8 and 8a. *Sphenopteris*. Fig. 9. *Trichomanites*

- 15 *Rhynchonella Mainensis*, N. sp.
- 16 *R. nucleolata*, Hall.
- 17 *R. Aspasia*, N. sp.
- 18 *R.* like *R. bialveata*, Hall. One imperfect specimen.
- 19 *Rensselaeria Portlandica*, N. sp.
- 20 *Eatonia medialis*, Hall.
- 21 *Leptocoelia* ? One imperfect specimen of a N. sp.
- 22 *Retzia Maria*, N. sp.
- 23 *R. Hippolyte*, N. sp.
- 24 *R. dubia*, N. sp.
- 25 *R. Electra*, N. sp.
- 26 *Atrypa reticularis*, Linn.
- 27 *Athyris Blancha*, N. sp.
- 28 *A. Harpalyce*, N. sp.
- 29 *Spirifera macropleura*, Con.
- 30 *S. raricosta*, Con. *S. Hesione* ? Billings.
- 31 *Platyceras* } Both allied to *P. subangulata*.
- 32 *P.* }
- 33 *Loxonema Fitchi* ? Hall.
- 34 *Orthoceras rigidum*, Hall.
- 35 *Dalmanites Epicrates*, N. sp.
- 36 *Phacops Trajanus*, N. sp.
- 37 *Prætus Macrobius*, N. sp.
- 38 *P. Junius*, N. sp.
- 39 *Bronteus Pompilius*, N. sp.
- 40 *Lichas* ? a fragment supposed to belong to a species of this genus

The aspect of the whole collection is that of the Lower Helderberg, while several of the species, (*S. punctulifera*, *S. indenta*, *R. nucleolata*, *E. medialis* and *S. macropleura*), are especially characteristic of that formation. It will be observed that there are a number of new species, and as it is not quite clear that this Fauna can be exactly paralleled with the Lower Helderberg, (although it must certainly be very nearly related) it is best to call it Upper Silurian for the present. I think it will be found difficult to classify the smaller groups of rocks in that part of North America lying East and South-east of the Appalachians so as to bring them into a perfect co-ordination with those of Western New York and the Western States. There are several faunas in the East which do not occur in New York at all. But it is easy to recognize the larger groups, such as the Upper Silurian and Devonian. And the safest course to pursue would be not to report the smaller ones until they can be clearly identified.

One of the species in the above catalogue was pointed out last year by me as *Spirifera perlamellosa*, Hall, and it is so cited in last year's Report of the Maine State Survey, p. 240. It is however a different species, closely allied, if not identical with one that occurs in the Devonian rocks of New York and Canada West. As there appears to be some difference and as there is also much uncertainty in the nomenclature, I propose to call it *S. Hesione*, but refer it for the present provisionally to *S. raricosta*, Con. *Athyris Blancha* is the species cited as *A. bella* in last year's report. In the above list there are 14 species unnamed. Some of these, such as the Corals, Crinoids and Bryozoans cannot be defined specifically on account of the imperfection of the specimens. By giving names to the others we should in all probability add something more to the confusion which prevails at present from hasty examinations.

FOSSILS FROM MASARDIS.

The fossils from Masardis are Crinoids, a new species of *Orthis*, *Strophomena rhomboidalis*, *Spirifera Nympha*, *Atrypa reticularis* and *Cheirurus Tarquinius*. This rock is also Upper Silurian and of the same age as that at Square Lake. One of the species, *C. Tarquinius*, is quite common at Port Daniel on the Bay of Chaleur, where it is associated with *Bronteus Pompilius* so characteristic of the Square Lake limestone.

FOSSILS FROM TELOS LAKE.

The fossils from this locality are all more or less distorted, and too imperfect to be determined with certainty with the exception of one species, *Leptodomus Mainensis*. They are,—

- 1 The arms of a large Crinoid.
- 2 *Chonetes* ?
- 3 *Rhynchonella* or *Retzia*.
- 4 *Rensseleria ovalis*, Hall,—or a closely allied species.
- 5 *Leptodomus Mainensis*, N. sp.
- 6 *Platyostoma ventricosa* ? Con.
- 7 *Orthoceras* ? like *O. rigidum*, but more coarsely striated.
- 8 *Dalmanites*.
- 9 Fragment of a large *Avicula* or *Pterinea*.

These fossils are most probably from the base of the Devonian near the Oriskany sandstone.

FOSSILS FROM THE WEST END OF TELOS LAKE.

- 1 *Strophomena rhomboidalis*.
- 2 *Streptorhynchus radiata*, Vanuxem. *Strophomena radiata*, Pal. N. Y. Vol. 3, Pl. 18, fig. 8. This species occurs both in the Lower Helderberg and in the Oriskany Sandstone in Canada.
- 3 *Rensseleria ovalis*, Hall.
- 4 *Spirifera*.

The rock at this locality is of the same age as that last mentioned.

ZOOPHYTA.

1. *FAVOSITES GOTHLANDICA*, Lam.

There is so much difference of opinion as to the extension that should be given to this species, that it is quite impossible, in the present state of science, to say whether the specimens from Square Lake should be included in it or not. Numerous forms of the genus *Favosites* abound in the Silurian and Devonian rocks of all countries, and yet, there are no fossils more difficult to determine. If we take a large number of well preserved specimens, from any one locality, it is possible to arrange them into groups which appear to be species. But if we place alongside of them another collection from a locality five or six hundred miles distant, in the same formation, we shall find it most difficult to distribute this second set of specimens, in such a manner, as to correspond with the arrangement of the first. There will be a few of the forms, no doubt, identical; but others will fill up those blanks which were considered to be good specific intervals in the classification of the first set of specimens, in such a manner as to throw the whole into confusion and doubt. This may

be proved either by comparing collections or the figures and descriptions of different authors. I believe the species of this widely distributed genus will never be clearly defined, until some one of our larger scientific institutions shall take up the subject and bring together great numbers of specimens from all parts of the world, so that the whole genus can be taken in and examined at one view. Until then, our determinations (at least such of them as relate to forms resembling *F. Gothlandica*) for the greater part, cannot be, in fact, regarded as based upon very solid foundations.

[The specimens from Square Lake are fragments of colonies, which, when unbroken, must have been several inches and perhaps more than one foot in diameter. The tubes are, in some places, straight for three or four inches; and elsewhere, in the same specimen, curved in contorted groups, in different directions. The larger tubes are about one line in diameter, but, intermingled with these are numerous smaller ones of all sizes down to half a line. The diaphragms are flat and closely arranged, usually three or four in one line. Pores are obscurely visible on some of the flat sides of the tubes, but I have not been able to make out their number and distance.]

Locality and Formation. Square Lake, Maine; Upper Silurian.

OTHER CORALS.

Besides the above, there is a *Zaphrentis* about the size of *Z. prolifica* and fragments of what may be a *Diphyphyllum*, all too badly preserved to be described.

CRINOIDEA.

There are three or four species of Crinoids at Square Lake, not determinable.

BRACHIOPODA.

STROPHOMENA RHOMBOIDALIS, Wahlenberg.

Leptaena depressa, *S. depressa*, *Leptaena rugosa*, *S. rugosa*, &c., &c. Either wholly or in part of the generality of authors.

Pl. III. Fig. 1, *STROPHOMENA RHOMBOIDALIS*, a specimen with the front margin rounded instead of straight.

Description. Rhomboidal or irregularly semi-oval, widest on the hinge line, occasionally somewhat square; visceral disc strongly corrugated by from five to fifteen deep undulating concentric wrinkles; both valves abruptly bent at one-half or two-thirds the length to form a broad margin deflected towards the dorsal side. In the ventral or convex valve the disc is nearly flat, but with a small portion in front of the beak gently tumid. The curvature of the dorsal valve conforms very nearly to that of the ventral. Area of ventral valve, narrow, seldom exceeding half a line in width; the dorsal area still narrower; the two areas inclined towards each other at an angle which varies from 30° to 60°. Foramen of ventral valve large, triangular, wider than high, partly filled by the two projecting extremities of the divaricator processes of the dorsal valve. Surface covered with fine crowded striae of a nearly equal size throughout, five or six in the width of one line. Width from one inch to one inch and a half; length about one third less than the width. Specimens two inches wide sometimes occur. One of those from Square Lake is only five lines wide and has only five concentric grooves.

This is the most remarkable of all the species of *Strophomena*, on account of its having maintained its existence throughout such vast periods of time. It made its appearance about the close of the Lower Silurian, and lived on through all the immeasurable ages of the Middle Silurian, Upper Silurian,

Devonian and the first half of the Carboniferous period. It thus witnessed, as it were, the birth, the growth, the long seasons of prosperity, the gradual decay and the burial of three successive creations of animal life. All other species of *Strophomena* had either become extinct long before, or disappeared just at the close of, the Devonian period; but this one still remained in the palæozoic seas until the Carboniferous Epoch was well advanced, and for a long time stood alone, a solitary form, the last of its race.

Prof. Hall says he has seen specimens of this species labelled *Strophomena rugosa* in the hand writing of Rafinesque, Pal. N. Y., Vol. 3, p. 195. But manuscript names are of no authority; at least, they are not sufficient to suppress a previously published name. The figure given by De Blainville in the "*Manuel de Malacologie*," Pl. 53, fig. 2-2 a, in 1827, is certainly not this species; yet it purports to be *S. rugosa*, the supposed type of the genus.

Genus STROPHODONTA, Hall.

The three following species have been placed by Prof. Hall in his genus *Strophodonta*. That genus was originally described as consisting of species with no foramen and with the area striated. But I have found that these are not constant characters. In the Lower Silurian all the species of *Strophomena* have the area smooth. In the Middle Silurian we meet with forms which have a few striæ on each side of the foramen. In the Upper Silurian are found other species with a considerable portion of the area on each side of, and next to the foramen striated but still with the extremities for a greater or less distance from the cardinal angles, smooth. In the Devonian those with the area striated the whole length first make their appearance, but they are associated with many which have it partly plain. In like manner there is a gradation on the size of the foramen but in the reverse chronological order. All the Lower Silurian species have a wide foramen, but in the succeeding formations it grew gradually smaller and smaller until at length it was reduced to a mere line, and finally in some species disappeared altogether. In the meantime there was no change in the form while the internal characters remained also the same with the exception of the gradual introduction of a small callosity in the rostral cavity of the ventral valve. Genera ought to be founded upon characters so peculiar to the species included in them that they can be separated into natural groups. But no one can draw the line between *Strophomena* and *Strophodonta*, so gradually do the characters upon which the latter genus has been instituted fade away into those of the former.

I shall therefore with all due deference place the following species in the genus *Strophomena*.

STROPHOMENA PUNCTULIFERA, Con.

Pl. III. Fig. 2. *Strophomena punctulifera*; a, dorsal valve; b, area, the foramen not preserved; c, longitudinal section of one of the forms.

Remarks. To this species I refer those forms figured in the Palæontology of New York, Vol. 3, under the names of *S. punctulifera*, *S. Headleyana*, *S. cavumbona*; and probably some others might be included with advantage to science. The length and breadth vary greatly in different specimens, and so do the surface characters. The shell has sometimes a gentle sigmoid curve as represented, (fig. c.); but it is often found bent about the middle almost at right angles. Between these extremes every degree of curvature occurs. The surface is usually covered with rather closely crowded coarse angular striæ, increasing both by subdivision and the introduction of separate ridges. These are crossed by fine concentric striæ which are rarely preserved in specimens derived from a sub-crystalline limestone like that of Square Lake. In others, the angular radiating striæ are distant sometimes one line or a little more from each other in the front and middle of the shell, the intervening spaces being concave, and with the concentric striæ more or less distinctly dis-

played. The radiating striæ vary indefinitely in their distance from one line to one-sixth of a line. No distinction of species can be maintained on the surface characters of this particular group. The area of the ventral valve also varies in its width, and slightly also in the amount of its inclination to that of the dorsal valve. The foramen is rarely preserved, but its width at the base in all the specimens in which I have seen it is a little less than half its height. A portion of the area on each side of the foramen from one-fourth to three-fourths the length is ornamented with fine striæ parallel with the sides of the foramen. The casts of the inner surface of the shell are more or less coarsely punctured, but the inner surface of the shell itself is covered with small rugose tubercles.

Locality and Formation. Square Lake, Maine; Upper Silurian.

STROPHOMENA INDENTA, Con.

Pl. III. Fig. 3. *Strophomena indenta*, Con.

Remarks. In this species the ventral valve is convex and the dorsal concave; the front margin is broadly rounded, the cardinal angles are compressed and either rectangular, slightly rounded or somewhat acute,—varying from a little less to a little greater than a right angle. On comparing a large number of specimens from Cape Gaspe, at the mouth of the St. Lawrence, Port Daniel on the Bay of Chaleur, and Square Lake, all the variations in the surface characters noticed in *S. punctulifera* have been observed. When perfect the surface always shows a set of fine longitudinal striæ which occur both in the spaces between the longer ones and also on these latter. The greater part of the shell is sometimes covered with concentric undulations, but in general only a small portion in the neighborhood of the beak is thus marked.

The largest specimen I have seen is only eleven lines in length and thirteen in width.

Notwithstanding the abundance of the specimens no perfect ones have been noticed, and the characters of the area, foramen and interior remain to be ascertained. In fact, this species can hardly be said to be established yet.

I refer those from Square Lake to this species provisionally; they are perfectly identical specifically with those from the Upper Silurian rocks of Gaspe, and Port Daniel on the Bay of Chaleur.

Locality and Formation. Square Lake, Maine; Upper Silurian.

STROPHOMENA PERPLANA, Con.

Remarks. In this species both valves are almost flat and covered with fine striæ of a nearly uniform size, from six to nine in one line, usually about six. The radiating striæ are crossed by fine concentric lines rarely preserved in crystalline limestone.

Several specimens, very imperfect, from Square Lake, appear to be of this species.

I include in this species *S. perplana* and *S. pluristriata*, Con., and also *S. planulata*, *S. arcuistria* and *S. fragilis*, Hall.

Genus ORTHIS, Dalman.

Of this genus there are two or three species in the collection. The specimens are too imperfect for determination. They resemble such forms as *O. oblata* and *O. discus*, from the Lower Helderberg, New York.

GENUS RHYNCHONELLA, FISCHER.

RHYNCHONELLA MAINENSIS. N. sp.

Pl. III. Fig. 4. *Rhynchonella Mainensis*, N. sp.

Description. Transversely ovate, length about one-fifth or one-sixth less than the width. Ventral valve moderately convex, most elevated at about one-third the length from the beak; mesial sinus deep in front, flat in the bottom, the sides sloping outwards, becoming obsolete at two-thirds the length of the shell; beak well defined, incurved down to the umbo of the dorsal valve; on each side of the beak a small ovate excavation extending towards the cardinal angles; umbo only slightly elevated, this valve being only half a line longer than the dorsal. Dorsal valve strongly and uniformly convex, nearly hemispherical, most elevated in the upper half, with a wide flat mesial fold elevated about one line above the general surface at the front margin, but becoming obsolete at two-thirds the length; beak pointed, well defined but only visible when that of the opposite valve is broken away.

Surface with from twenty-five to thirty ribs, of which there are from four to six on the mesial fold and from three to five in the sinus. All the ribs die out before reaching the beak, the upper one-fourth of the shell being smooth. On approaching the front margin the ribs are obscurely angular, but towards the upper part of the shell they are neatly rounded but not strongly elevated.

Width ten to twelve lines; length about one-fifth or one-sixth less than the width; depth of both valves six to eight lines; depth of the sinus in the front margin of the dorsal valve, about three lines.

The curvature of the ventral valve from the beak along the median line and the bottom of the sinus is an uniform arch, somewhat most abruptly curved in the upper half. This curve cannot be seen in the profile of the whole shell, as it lies partly in the sinus.

This species is closely allied to *R. abrupta*, Hall. Pal. N. Y. Vol. 3, p. 223. Pl. 31, fig. 3, but differs therefrom in being more ventricose in the upper part of the dorsal valve; in having the ventral valve uniformly arched along the sinus instead of abruptly bent upwards nearly at right angles to the dorsal valve; and in not having the ribs in the sinus bifid at their extremities.

Locality and Formation. Square Lake, Maine; Upper Silurian.

RHYNCHONELLA NUCLEOLATA, Hall.

R. nucleolata, Hall. Pal. N. Y. Vol. 3, p. 227, Pl. XXI. figs. 1 and 2.

Pl. III. Fig. 5. *Rhynchonella nucleolata*; a, dorsal, b, front, and c, side views.

Description. This species is smaller than *R. Mainensis*, and has the surface marked by only fifteen or twenty ribs towards the front, the upper part being smooth. The outline is sub-circular or sub-pentagonal; the width varies from a little less to a little greater than the length. Ventral valve depressed convex, a small portion of the margin abruptly deflected to meet the margin of the dorsal valve; the mesial sinus becomes obsolete about the middle of the shell, but on approaching the front margin the portion of the shell constituting the bottom of the sinus is suddenly bent almost at right angles to the plane of the lateral margin and forms a projection which fits into a deep oblong notch of the opposite valve. Beak small, pointed, apparently incurved so as just to cover that of the dorsal valve. (It is not well preserved in the specimen examined.) Dorsal valve very convex strongly elevated in the first half, where there is a short mesial fold; the upper half of the shell varies greatly in the amount of its gibbosity being, in some, depressed convex, and in others, rather strongly and broadly tumid; beak angular, prominent but concealed beneath that of the ventral valve. There is a short mesial septum extending from the beak of this valve nearly half the length which can be distinctly seen when the shell is partially or wholly removed.

Of this species there are only two good specimens in the collection from Square Lake. It is very difficult to say whether they should be referred to *R. nucleolata* or to *R. pyramidata*. One of them has the dorsal valve strongly convex in the upper half and the other, depressed convex, but they both unquestionably belong to the same species.

Locality and Formation. Square Lake, Maine; Upper Silurian.

RHYNCHONELLA ASPASIA.

Pl. III. Fig. 6, *Rhynchonella Aspasia*. Dorsal and side views of a young individual. The large specimens have the base not so distinctly rectangular but a little more rounded.

Description. Transversely sub-elliptical; greatest width about one-fifth more than the length. Ventral valve narrowly convex on the umbo; a mesial sinus commencing at about one-fourth of the length from the beak and growing deeper with an uniform curve to the front margin where it is full one-half the whole width of the shell and deeply indents the opposite valve; on each side of the sinus one or two ribs more prominent than the others; outside of these the surface is depressed convex and shows a tendency to become slightly concave close to the margin; beak small, closely incurved and nearly if not quite in contact with the umbo of the opposite valve. Dorsal valve rather strongly but narrowly convex along the median line, sloping to the sides; mesial fold strongly elevated in front, dying out at about half the length. Surface in young specimens with seven or eight strong angular ribs on each valve; one rib in the sinus and two on the mesial fold. In old specimens, about twelve ribs on each valve of which there are two or three in the sinus and three or four on the fold.

The greatest width is about the middle of the shell. On a side view of a young shell the most elevated point of the dorsal valve is just at the front margin on the top of the fold, and the base has a rectangular form. In the old specimens, on a side view the front is not so decidedly angular, but slightly rounded. Width of the largest specimen, 7 lines; length, 6 lines. Width of smallest specimen, $4\frac{1}{2}$ lines; length, $3\frac{1}{2}$ lines.

This species is allied to both *R. altiplicata* and *R. acutiplicata*, Hall. Pal. N. Y., Vol. 3, Pl. XXXIII., and seems to stand between them. It is proportionally wider than the former and not so numerously ribbed as the latter. It may be that a greater number of specimens would afford us the means of uniting all three.

Locality and Formation. Square Lake, Maine; Upper Silurian.

GENUS EATONIA, HALL.

This genus appears to me to be very closely related, if not identical, with *Camarophoria*, King.

EATONIA MEDIALIS, Hall.

E. medialis and ? *E. eminens*, Hall. Pal. N. Y. Vol. 3, p. 241, 242, Pl. XXXVII.

Pl. III. Fig. 7. *Eatonia medialis*—four views of the same specimen.

Description. Transversely ovate, width a little greater than the length; in some specimens the hinge line straight and nearly equal to the greatest width of the shell. Ventral valve with a narrow and rather prominent umbo, which becomes broader and more depressed to near the middle of the shell where a deep concave sinus commences and greatly indents the front margin. On each side of the umbo and sinus this valve is flat or gently concave, often with a slightly elevated margin; beak small, closely incurved. Dorsal valve rather

strongly and broadly ventricose, with an elevated mesial fold which becomes obsolete at one-half or two-thirds the length of the shell; beak buried beneath that of the ventral valve. In some specimens there is a narrow sharp groove along the mesial line of the umbo of the dorsal valve.

Surface with from ten to fifteen inconspicuous depressed rounded ribs, sometimes bifurcated, three in the sinus and four on the mesial fold. The specimens are somewhat exfoliated and do not exhibit any concentric lines. The ribs become, in some of the specimens, very obscure towards the beaks; but in general they are distinguishable all the way.

The specimens are a little smaller than those from the Shaly Limestone of the Lower Helderberg rocks of New York, and on each side of the mesial sinus have one or two ribs more elevated than the others. *E. eminens* has the ribs more angular, but seems to be only a variety.

Locality and Formation. Square Lake, Maine; Upper Silurian.

GENUS RETZIA, King.

[*Trematospira* and *Rynchospira*, Hall.]

RETZIA MARIA, N. sp.

Pl. III. Fig. 8. *Retsia maria*. Dorsal and side views.

Description. Shell broadly ovate or sub-circular; width a little greater than the length; both valves moderately and nearly equally convex, giving a sub-lenticular shape. Ventral valve uniformly arched from beak to front, the curve slightly the most flattened in the front half; beak small with an elevation of scarcely one line, arched over the umbo of the opposite valve but scarcely in contact therewith; a small perforation in the apex. Dorsal valve most abruptly arched and most elevated in the upper third; beak buried beneath that of the opposite valve. Both valves are slightly compressed on each side of the umbones. Surface with sixteen coarse rounded ribs, extending all the way to the beaks, with rounded concave grooves between, nearly equal to the ribs in width. On the ventral valve the median groove is nearly twice the width of the others. On the dorsal valve the mesial rib is also twice the average width, but is obscurely divided into three. This character seems to be more or less distinctly exhibited by most of the species of this genus.

The above description is based upon a single specimen which is ten lines in length, eleven lines in width and six in depth. It is sub-circular somewhat narrowly rounded in front, the dorsal valve having a nearly straight hinge line, half the width of the shell.

But along with the above specimen there are several small ones which have the front either obtusely rounded or a little emarginate. They are about four lines in length and may be young individuals of this species. If so, the form is variable.

In the large specimen the shell appears to be exfoliated all over to a small extent and therefore the rounded aspect of the ribs may be due to their imperfection. In very perfect individuals they may be sharply angular.

Locality and Formation. Square Lake, Maine; Upper Silurian.

RETZIA HIPPOLYTE, N. sp.

Pl. III. Fig. 9. *Retsia Hippolyte*. Dorsal views of the specimens. (See remarks on the varieties below.)

Description. Shell transversely ovate or obscurely sub-pentagonal; both valves varying from moderately to strongly ventricose; greatest width about the middle. Ventral valve strongly and uniformly arched from beak to front, most abruptly curved in the upper half, with a well defined concave or sub-

angular mesial sinus, which, commencing in a point on the umbo, grows gradually deeper and wider to the front margin. Dorsal valve with a strong angular or narrowly rounded mesial fold which becomes obsolete about the middle of the shell; on each side of the fold descending with a slightly concave slope to the margin in the front half, and sometimes, but not always, in the upper half. Umbo of ventral valve prominent; beak incurved down to the umbo of the dorsal valve, perforated by a small aperture. Surface with about sixteen angular ribs of which those on the mesial fold are sometimes bifurcated. In the mesial sinus of the ventral valve there are from two to five ribs and often the intermediate groove which separates the two in the bottom of the sinus is larger than the others.

Length from six to eight lines; width a little greater than the length.

(VARIETIES.)

The figures given represent one of the forms of this species. Some of the individuals are obscurely pentagonal being somewhat angular on each side at about half the length of the shell. The proportional width and depth also varies: thus, in one specimen eight lines wide the depth of both valves is four lines; in another, the width is seven lines and the depth five lines. The small ones have the mesial fold and sinus feebly developed. One imperfect specimen has only ten ribs all much larger than usual, and it is probable that this may be a distinct species closely allied to *R. costata*, Hall. Pal. N. Y. Vol. 3. Pl. XXVIII. A, fig. 2.

AFFINITIES OF THIS SPECIES.

This species is certainly most closely allied to *Retzia perforata* (*Trematospira perforata*). Hall. Pal. N. Y. Vol. 3, p. 208. Pl. XXVIII A, figs. 3a—k. The only difference that I can see is that in the New York species the greatest width of the shell is always about the upper third, while in ours it is at the mid-length. *Retzia camura*, Hall, figured on the same plate, and also *R. simplex* must be closely allied to this species. The former is proportionally wider in the upper half, as represented in two of the figures, but in a third figure the shape is nearly the same as ours. *R. simplex* is more strongly ribbed.

Retzia maria, above described, differs from this species in its more nearly circular shape, larger ribs and in being almost entirely destitute of a mesial fold and sinus.

Locality and Formation. Square Lake, Maine; Upper Silurian.

RETZIA DUBIA, n. sp.

Fig. 10. *Retzia dubia*, dorsal and side views.

Description. This species has a straight hinge line which is equal in length to the width of the shell, but in every other respect it so closely resembles *R. Hippolyte* that it may yet turn out to be a variety thereof. The ventral valve is convex, uniformly arched from back to front, most elevated and abruptly curved in the upper half; umbo prominent; beak incurved down to the umbo of opposite valve, minutely perforated; mesial sinus commencing on the umbo with a sharply impressed line which gradually enlarges until it becomes at the front margin, wide and moderately deep and rounded in the bottom. In this valve there are fourteen ribs, of which the two in the sinus are separated by a wider groove than the others. Dorsal valve moderately convex, most elevated along the middle, the mesial fold in front strongly elevated; thirteen ribs including a large one on the mesial fold. The cardinal angles are compressed so that the hinge line exhibits a sharp edge with only a trace of an area close to the beaks.

Width, nine lines. Length, eight lines.

There is only one specimen of this in the collection, and it may be that all

those referred to *R. Hippolyte*, are only specimens of this species with the angles broken off. If so, then the name proposed for this one must be suppressed.

RETZIA ELECTRA. n. sp.

Fig. 11. *Retzia Electra*. Dorsal views of two specimens.

Description. Shell small, sub-pentagonal; greatest width at the mid-length or a little above; the sides converging to the umbo with a nearly straight slope, and to the anterior angles with a gently convex slope; front margin either gently convex, straight or gently concave in the middle. Ventral valve varying from moderately to rather strongly convex, most prominent in the upper half, uniformly arched from beak to front, most strongly curved in the upper third; a shallow concave sinus extending quite to the beak; umbo prominent; beak nearly if not quite in contact with the umbo of the dorsal valve; perforated. Dorsal valve the smaller, somewhat less convex than the ventral, most prominent about the middle and either with or without a shallow mesial sinus. Surface with about sixteen angular ribs, those in the sinus smaller than those on each side.

This species is about the size and closely resembles *R. globosa* (*Trematospira globosa*), Hall, Pal. N. Y. Vol. 3, p. 215. Plate XXXVI. fig. 1—a—p, and also *R. formosa* on the same plate. According to the figures the sinus, in the two species referred to, is broad at the front margin and narrows to a point before reaching the beak, sometimes a little above the middle of the shell. In *R. Electra* it is well defined all the way to the beak, or very nearly so, and is not narrowed to a point as represented in the above figures; its sides are straight instead of concave. In the dorsal valve, when present, it differs in the same way but not to the same extent. It appears also to be rather more finely ribbed than *R. globosa*, and not so broadly rounded in front. Its form is more like the smaller specimens of *T. formosa*, and it has about the same number of ribs; but the form of the sinus gives it a different aspect.

Length, about four lines; width varying from a little less to a little more than the length.

Locality and Formation. Square Lake, Maine; Upper Silurian.

ATRYPA RETICULARIS, Lin.

Remarks. This species appears in the American Palæozoic seas just at the close of the Hudson River Period, and lived on through the Middle Silurian, Upper Silurian and Devonian. It does not appear to have existed during the Carboniferous Age. Its geological range is thus greater than that of any other species except *Strophomena rhomboidalis*, which appeared shortly before it, and survived it for a short period.

Locality and Formation. Square Lake, Maine; Upper Silurian.

GENUS *STRICKLANDIA*, Billings.

This genus was first described by me in the Canadian Naturalist and Geologist, Vol. 4, p. 132, April, 1859. Afterwards in the month of October, 1859, or thereabout, Prof. Hall published his genus *Rensseleria* in the 12th Annual Report of the Regents of the State of New York. This latter genus is closely allied to the former, the general form being the same, but differing in having no triangular chamber beneath the beak of the ventral valve. I retain it for the present as a sub-genus, or perhaps both should be considered as sub-genera of *Pentamerus*.

SUB-GENUS RENSSSELÆRIA, Hall.

RENSSELÆRIA PORTLANDICA, n. sp.

Fig. 12. *Rensselæria Portlandica*. a, dorsal view; b, side view of the largest specimen.

Description. Shell lenticular, both valves about equally convex, transversely ovate or sub-circular; width a little greater than the length; hinge line somewhat straight, the two halves forming a very obtuse angle at the beak; cardinal angles rounded; sides gently convex; greatest width of the shell about the middle; the front half somewhat narrower than the upper half; front margin with a small portion in the middle, straight or gently concave. Ventral valve moderately and uniformly convex with a faint mesial sinus which, in young specimens, reaches the beak; the greatest convexity of the shell in the upper half; umbo small; beak small, pointed and closely incurved down to the umbo of the opposite valve, not perforated. Dorsal valve slightly less convex than the ventral, with an obscure mesial sinus similar to that of the other valve; umbo obtusely rounded; beak buried beneath that of the opposite valve.

Surface covered with depressed convex, small radiating ribs, of which there are between three and four in the width of one line at the front margin. These ribs are of an equal size and appear to be not bifurcated.

The internal character of this peculiar species being unknown, its generic place is quite doubtful. The surface of the shell is very similar to that of *R. ovoides*, the common form of the Oriskany Sandstone, while its form is not unlike *R. ovalis*. On account of these characters it is referred to this genus.

Locality and Formation. Square Lake, Maine; Upper Silurian.

Genus *ATHYRIS*, McCoy.

To this genus I refer species of that group of which *A. tumida* is the type. In this sense it is precisely equivalent to *Meristella*, as defined by Professor Hall. The dorsal valve has a mesial septum and the ventral valve has the beak usually closed. *Spirigera*, DeOrbigny, has no mesial septum, and the beak of the ventral valve is usually perforated,—type, *S. concentrica*.

ATHYRIS BLANCHA, n. sp.

Fig. 13. *Athyris Blancha*. Dorsal and front views of a large specimen.

Description. Transversely broad ovate, greatest width a little above the middle; sides from the beak to about the middle nearly straight or gently convex; front margin broadly rounded and usually with a small portion in the middle straight or concave. Ventral valve varying from moderately to strongly convex, evenly arched from beak to front, most narrowly curved in the rostral one-third of the length and most elevated a little above the middle; beak small incurved down to the umbo of the dorsal valve, but only slightly projecting over the hinge line; umbo small elevated about half a line above that of the opposite valve in a specimen ten lines in length; mesial sinus varying from sharply-angular to narrowly-concave in the bottom, usually very deep at the front margin but becoming obsolete about the middle or a little above the middle of the shell. Dorsal valve slightly less tumid than the ventral, most prominent at about one-fourth or one-third the length of the shell from the beak, a small portion of the front margin of the shell usually turned upwards by the sinus of the opposite valve; umbo narrowly tumid; beak buried beneath that of the ventral valve; in one specimen a dark line indicating the position of the septum is seen extending half the length from the beak. Surface with the general aspect smooth, but some specimens exhibit a few concentric striae which however are very indistinct. There are also on some specimens a few concentric interruptions of growth.

Length of the largest specimen examined, ten lines; width, fourteen lines.

Of another, the length is nine lines and the width eleven. Of a third, length seven lines; width, eight lines. Of a fourth; length, six lines; width, the same.

By these measurements it will be seen that the proportional length and width is variable to some extent, the longest being the broadest.

Athyris bella, Hall, Pal. N. Y. Vol. 3, Pl. XL., has a sinus on both valves. *A. arcuata*, Hall, Loc. Cit., Pl. XII. most resembles this species, but is proportionally narrower, has the umbo of the ventral valve more prominent, the sinus of the same valve usually rounded in the bottom and the dorsal valve strongly elevated or obtusely carinated along the middle. In our species the sinus of the ventral valve not only deeply indents the front of the dorsal but turns up a small portion of the margin.

In the young specimen the cardinal sloping edges of the ventral valve are incurved at a sharp rounded angle, but in the adult this character disappears.

Locality and Formation. Square Lake, Maine; Upper Silurian.

ATHYRIS HARPALYCE, n. sp.

Fig. 14. *Athyris Harpalyce*. Dorsal and side views. The beak of the ventral valve is mutilated in the specimen.

Description. Shell pentagonal, greatest width about the middle; sides at the point of the greatest width forming a rounded angle, thence nearly straight to the beak where they meet at an obtuse angle of about 100° ; from near the middle or a little in front thereof also straight and converging at the same angle to the anterior angles; a portion in the middle of the front margin equal to one-half the greatest width straight. Ventral valve moderately and evenly convex with a wide shallow sinus in the front half; cardinal edge on each side of the beak, angular. Dorsal valve moderately convex, without a mesial fold or sinus; umbo small but distinct. In this valve the line indicating the mesial septum is distinctly seen on the outside of the shell extending nearly half the length. Surface smooth or with very indistinct concentric lines of growth.

Length of the specimen without the beak, 5 lines; width, $6\frac{1}{4}$ lines.

Locality and Formation. Square Lake, Maine; Upper Silurian.

SPIRIFERA NYMPHA, n. sp.

Fig. 15. *Spirifera Nympha*. Dorsal and side views.

Description. Shell smooth, transversely ovate; hinge-line straight, equal to or a little less than the greatest width; sides somewhat straight or gently convex and converging towards the front. Ventral valve strongly convex in the upper half, compressed towards the hinge extremities; umbo narrow, prominent; beak small, pointed, incurved; area triangular, rather more than half the width of the shell, at the base nearly at right angles to the plane of the lateral margin but strongly incurved beneath the beak; cardinal edge rounded; foramen triangular, its width on the hinge-line about equal to its height. In consequence of the nearly perpendicular area the length of this valve is only slightly greater than that of the dorsal valve. The mesial sinus commences at the beak and grows gradually deeper and wider to the front margin; it is angular in the bottom. Dorsal valve moderately convex with a depressed mesial fold extending to the beak; umbo wide and causing a gentle elevation in the hinge-line which towards the cardinal angles appears to be straight. The area of this valve is at a right angle with that of the ventral, or lies in the plane of the lateral margin.

Width as determined by three imperfect specimens, about eleven lines; length, six or seven lines.

This species is closely allied to *S. modesta*, Hall, Pal. N. Y. Vol. 3, p. 203, Pl. XXVIII. fig. 1, but is wider, has the mesial fold stronger, and the area of the ventral valve more nearly at a right angle to the plane of the lateral margin.

Locality and Formation. Masardis, Maine; in some mass of rock with *Cheirurus Tarquinius*. Upper Silurian.

SPIRIFERA MACROPLEURA, Con.

Fig. 16. *Spirifera macropleura*. Ventral view.

Remarks. This specimen agrees in every respect with the description and figures of the species to which it is referred. The surface is for the greater part smooth; but this is due to the state of preservation. On close examination the fine radiating striae characteristic of this species can be seen in the folds on the right side of the dorsal valve near the hinge-line where a portion of the shell remains. They are also preserved in the sinus of the ventral valve near the front margin.

Locality and Formation. Square Lake, Maine; Upper Silurian.

SPIRIFERA RARICOSTA? Con. (S. HESIONE, Bill)?

Fig. 17. *Spirifera raricosta?* Con. Dorsal view; the specimens do not show the foramen.

Remarks. This species appears to be identical with that which occurs in the Onondaga and Corniferous Limestones of New York. It is easily recognized by having six large rounded ribs on the ventral and five on the dorsal valve. These are crossed by numerous small concentric ridges which in passing over the ribs are undulated upwards. I have no specimens from the typical locality of *S. raricosta* for comparison and I am unable to state therefore whether or not the minute surface characters are precisely the same. Those from Square Lake are proportionally somewhat wider than those from Western Canada, and unfortunately none of our Canadian specimens have the surface of the shell preserved.

Vanuxem, in his final Report, p. 132, calls the species with which I suppose this to be identical *Delthyris undulatus*, and says on page 138, that it is different from *D. raricosta*. But I do not think the reason given by him for the distinction sufficient. Prof. Hall, in his final Report, also figures it under the name of *D. undulatus*, and in his corrected Catalogue of New York fossils appended to the 12th Annual Report of the Regents of the N. Y. University, it is changed to *Spirifer undulatus*. In the Canadian Journal, Vol. 6, p. 259, I have figured it and referred it to Conrad's species. The figure given by Conrad does not well represent this form and he makes no mention of the concentric striae in his description.

If Hall and Vanuxem have rightly separated the species referred to from *S. raricosta*, then it must be distinct and would require a new name, as *S. Undulatus* was long previously to the date of Vanuxem's Report, in use for a Permian species by Sowerby.

I propose therefore to call it *Spirifera Hesionae*, but shall not adopt that name until I can satisfy myself upon the several doubtful points above noticed.

Locality and Formation. Square Lake, Maine; Upper Silurian.

ACEPHALA.

The generic references under this Division must be regarded as merely provisional as the internal characters of the shells have not been observed.

Genus LEPTODOMUS, McCoy.

The following species, judging from their external characters, appear to be allied to *L. amygdalina*, Sowerby, of the Upper Ludlow, and may be congeneric therewith.

LEPTODOMUS, PEMBROKENSIS, n. sp.**Fig. 18.** *Leptodomus Pembrokensis*, an imperfect left valve.

Description. Shell transversely elongate ovate, moderately convex, obtusely rounded anteriorly in the lower third, then straight or gently concave along the ventral margin for rather more than half the length, then gradually curving upwards to the narrowly rounded posterior extremity which has its most projecting point at about one-third the height of the shell below the dorsal line. The dorsal margin is straight or gently concave from about the mid-length to a point situated about one-seventh of the whole transverse length from the posterior extremity, then obliquely truncate to the narrowly rounded termination of the shell.

The anterior half of the shell including the beaks and umbones is not preserved, but there is a wide shallow byssal sinus which is situated just in front of the middle of the ventral margin and can be traced obliquely forwards and upwards. Its course shows that the umbones and beaks are situated about one-sixth the whole length behind the most projecting portion of the anterior extremity. The shell is smooth (in this specimen) but covered with strong concentric undulations from one-fourth of a line to a line in width.

Transverse length, $3\frac{1}{4}$ inches; height from the ventral margin to the dorsal line at the middle of the shell, about $1\frac{1}{2}$ inches.

Locality and Formation. Pembroke, Maine; Upper Silurian? Precise geological horizon, doubtful, but most probably Devonian. Collected by Dr. Jackson; specimen is from the State collection at Augusta.

LEPTODOMUS MAINENSIS, n. sp.**Fig. 19.** *Leptodomus Mainensis*.

Description. Transversely elongate; dorsal and ventral margins parallel, the latter slightly concave just about the middle or a little in front thereof; anterior extremity short, narrowly rounded, the most projecting point a little below the mid-height of the shell; posterior extremity also narrowly rounded, somewhat pointed, the terminal point situated at about the lower third of the height; the upper two thirds of the posterior margin obliquely truncated with a scarcely convex, straight or slightly concave slope which passes into the hinge-line and makes an obtuse rounded angle therewith at a point situated a little more than one-fourth the length of the shell from the posterior end. The ventral margin, at the anterior extremity, begins to curve upwards at about one-fourth the length, and at the posterior at about one-fifth or one-sixth the length of the shell. The valves are rather strongly convex, obliquely tumid from the umbones backwards to the posterior extremity. The beaks are strongly incurved and the umbones flattened by the byssal sinus which extends obliquely backwards to the ventral margin where it renders the outline gently concave. The hinge-line shows a narrow flat area on each valve which is well defined for half the length from the beaks to the posterior extremity; a small portion of the area probably extends in front of the beaks; but this part is concealed in the specimens.

Surface with strong concentric undulations which on the umbones become sharply rounded narrow ridges from one-fourth of a line to one line apart.

Transverse length from two to three inches; height at the umbones about one-third the length.

This species resembles *L. Pembrokensis*, but is a little smaller and has the most projecting point of the posterior extremity below the mid-height of the shell instead of above.

Locality and Formation. Lake Telos, Maine; Lower Devonian.

LEPTODOMUS PERCINGULATUS, n. sp.**Fig. 20.** *Leptodomus percingulatus*.

Description. Transversely ovate, both extremities rounded, the most projecting points a little below the mid-height. In the outline the greatest elevation is at the umbo, from which there is nearly a straight slope downwards to the anterior extremity; while the hinge-line is somewhat straight and nearly parallel with the ventral margin for a little more than half the length from the umbo to the posterior extremity. The beaks are small, closely incurved and situated at the anterior third of the length. The umbones are prominent but flattened. There is a sharply rounded umbonial ridge extending a short distance from the beak on each side limiting an imperfect lunette both before and behind. The dorsal margin near the end of the hinge-line seems to be compressed.

Surface with about 18 strong, narrowly rounded concentric ridges, closely crowded on the umbones but becoming more distant on approaching the margin.

Transverse length of the specimen 7 lines; height at the umbones about 3 lines.

Locality and Formation. Moose Head Lake, Maine; Lower Devonian.

GASTEROPODA.

Among the fossils from Square Lake are two or three species of *Platyceras* in a fragmentary condition. One of these is about the size and shape *P. trilobatum* or *subangulatum*, Hall. Pal. N. Y. Vol 3, pl. LVII. The others are smaller. Before naming them it would be advisable to collect better specimens, in order to avoid confusion. There is one imperfect specimen which appears to be *Loxonema Fitchi*, Hall. Pal. N. Y., Vol. 3, Pl. LIV. fig. 9.

CEPHALOPODA.**ORTHOCERAS RIGIDUM, Hall.**

A fragment with central siphuncle and transversely striated surface like Prof. Hall's figures, Pal. N. Y. Vol. 3, Pl. LXX, occurs at Square Lake.

CRUSTACEA.**DALMANITES EPICRATES. n. sp.****Fig. 21.** *Dalmanites Epicrates*. Part of the head and thorax. *a*, side view of the eye enlarged; *b*, some of the lens-sockets still further enlarged.

Description. Head nearly semi-circular, the posterior angles produced backwards into spines the length of which has not been ascertained. Glabella clavate, gradually widening from the neck-furrow forwards, greatest width on a line drawn across it at one fourth its length from the front, the length including the neck-segment is (in the specimen) precisely equal to the greatest width*; the width at the neck-segment is little more than half the greatest width. The neck-segment is slightly larger than the posterior pair of lobes and appears to have had a tubercle in the middle. The neck-furrow is narrow, and deeply impressed for about one-third the width of the glabella on each side. It is in this part also slightly curved, its inner extremity being turned forwards. It can be traced all across the glabella, but on the median line it is very obscure. None of the other furrows cross the glabella, but all have their inner extremities separated on the median line by a space about equal to about one-fourth the width of the glabella at the neck-segment. The two posterior furrows are situated very nearly on a line drawn across the head passing through the eyes at about one-fifth their length from their posterior mar-

* As the glabella is somewhat flattened in this specimen by vertical pressure the true width is most probably a little less.

gins. These two furrows incline very slightly forwards and inwards and their outer extremities just reach the sides of the glabella but do not descend into the dorsal furrow. A line drawn across the head through the mid-length of the eyes would pass just along the anterior sides of the middle pair of furrows. These are at right angles to the median line, straight, and become obsolete at about half their own length from the sides of the glabella. The anterior furrows are wide and concave and so situated that a line drawn across the head at the fifth of the length of the eyes would pass through their posterior or inner extremities. From this line they proceed forwards and outwards to the lateral angles of the front lobe of the glabella. They are at first narrow but gradually enlarge and have their greatest width just opposite the anterior angles of the eyes. They then appear to become narrower. The front lobe of the glabella is gently and uniformly rounded in front; the lateral angles very narrowly rounded or somewhat pointed; the posterior margin bounded by the two nearly straight anterior furrows forms an angle of about 130° , but truncate at its apex. The sides of the glabella are well defined by the dorsal furrows which after crossing over the neck-segment are suddenly deepened as far as the anterior third of the eye where they become more shallow but are still well defined. At the anterior angles of the eyes they again become deeply impressed.

The eyes are very large, semi-oval, most strongly curved in the posterior half of their length (in this specimen) precisely equal to half the length of the glabella including the neck-segment; their height in the middle, half of their length. There are forty-three vertical rows of lenses and twelve or thirteen lenses in each row about the middle of the eye. There are in all, probably about 475 lenses. None of the lenses are preserved in the specimen but the hexagonal sockets are perfectly well defined. The visual surface of the eye is not perpendicular but slopes inwards so as to form an angle of apparently about 75° with the horizontal plane of the body. The upper edge of the eye is separated on the inner side from the gently tumid portion of the palpebral lobe by a shallow concave groove. From this to the dorsal furrow bounding the side of the glabella the surface descends with a gently convex slope.

In the specimen only a portion of the thorax is preserved. The axis is well defined by the dorsal furrows, moderately convex, apparently narrowly rounded along the middle third and then with a flat slope to the sides. The pleuræ are flat with a well defined groove which commencing at the dorsal furrow just at the upper side of the ribs curves at first rather suddenly downwards and then follows the middle outwards. The width of each segment on the axis is slightly less than one-fifth the length of the glabella including the neck-segment.

None of the other parts than those above described are preserved, only on one side of the specimen I think that I can see traces of a posterior spine to the left angle of the head.

Length of glabella including the neck-segment 12 lines; width of the front lobe 12 lines; width at the neck-segment $6\frac{1}{2}$ lines; length of the eye 6 lines; height of the same in the middle 3 lines.

I think that I can perceive on the front lobe of the glabella traces of the "fossettes" described by Barrande as existing in *Dalmanites Hausmanni*, and other allied species. There appear to be five of them. The principal one seems to be situated on the median line about one line in advance of the inner extremities of the anterior furrows. The second (on the right) about $2\frac{1}{2}$ lines from this and 2 lines from the edge of the lobe. The third $2\frac{1}{2}$ lines from the second and about the same distance from the outer angle of the lobe. Those on the left hand side are not visible. The five are thus arranged in the form of an obtuse angled triangle with its base or longest side across the front of the glabella and its apex directed backwards.

This species is certainly closely allied to several of those figured by Bar-

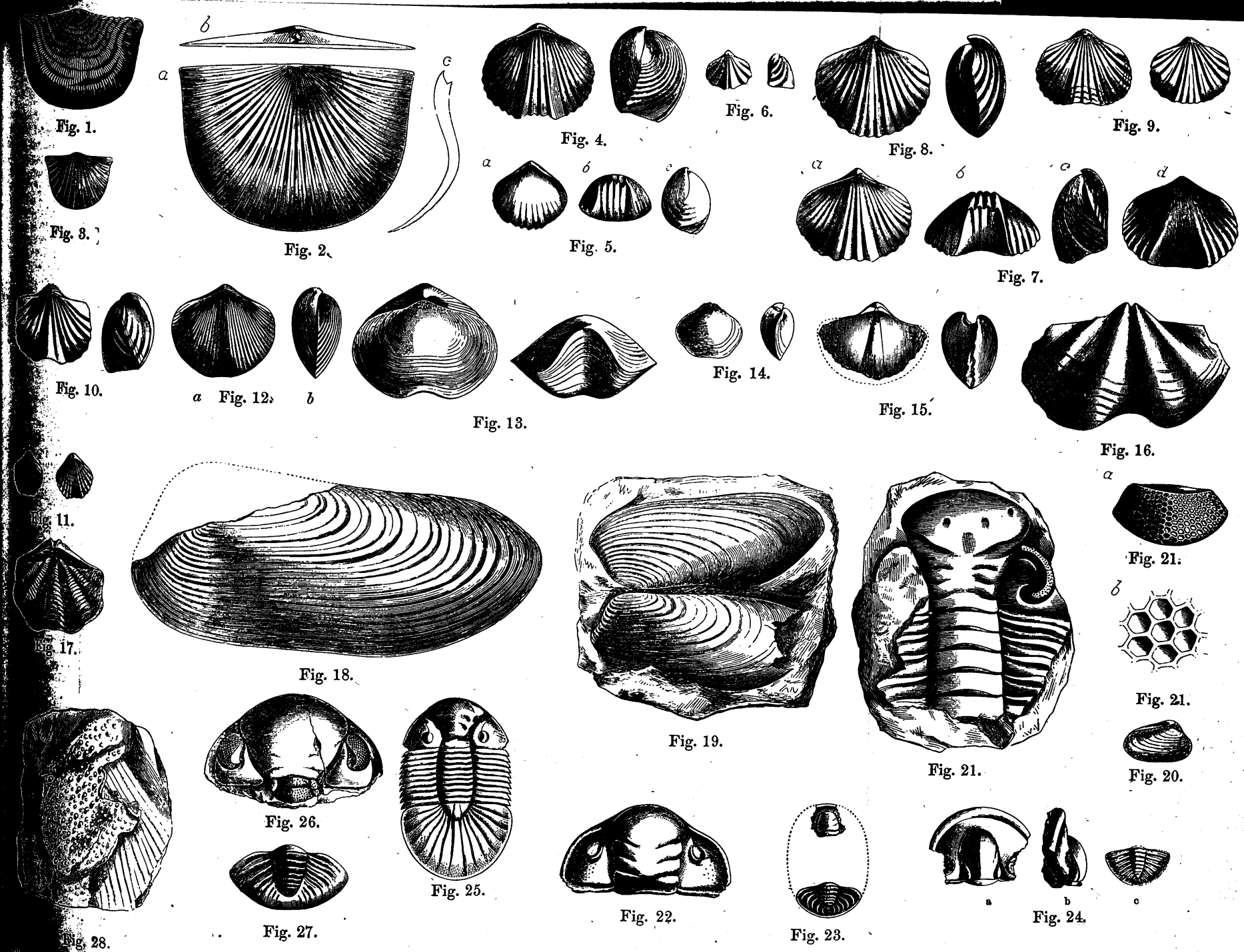


Fig. 1. *Strophomena rhomboidalis*, Wahl. Fig. 2. *S. punctulifera*, Con. Fig. 3. *S. indenta*, Con. Fig. 4. *Rhynchonella Mainensis*, Bill. Fig. 5. *R. nucleolata*, Hall. Fig. 6. *R. aspasia*, Bill. Fig. 7. *R. medialis*, Hall. Fig. 8. *Retzia maria*, Bill. Fig. 9. *R. Hypolyte*, Bill. Fig. 10. *R. dubia*, Bill. Fig. 11. *R. Electra*, Bill. Fig. 12. *Rensselaeria Portlandica*, Bill. Fig. 13. *R. macroleura*, Bill. Fig. 14. *A. Harpalyce*, Bill. Fig. 15. *Spirifera Nympha*, Bill. Fig. 16. *S. macroleura*, Con. Fig. 17. *S. raricosta* (?) Con. Fig. 18. *Leptodomus Pembrokensis*, Bill. Fig. 19. *L. macroleura*, Bill. Fig. 20. *L. percingulatus*, Bill. Fig. 21. *Dalmonites Epicrates*, Bill. Fig. 22. *Cheirurus Tarquinius*, Bill. Fig. 23. *Proetus Junius*, Bill. Fig. 24. *P. Macrobius*, Bill. Fig. 25. *Proetus Pompilius*, Bill. Figs. 26-27. *Phacops Trajanus*, Bill. Fig. 28. *Lichas* (?)

rande in his magnificent work upon the Bohemian trilobites, but does not seem to me to be precisely identified with any of them.

D. Hausmanni, Beyrich, has from 50 to 56 rows of lenses in the eye.

D. auriculata, Dalman, has 46 rows and as our species has 43 it might be thought that the difference if there were no other, might not be sufficient to separate them. But the glabella in the true species presents numerous small points of disagreement, giving a dissimilar aspect.

In like manner, *D. spinifera*, Barrande, *D. Renssi*, Barrande, *D. rugosa*, Corda, *D. cristata*, Corda, *D. Fletcheri*, Barrande, and some others more or less closely resemble ours and yet seem different in the minor details.

Of the American species none of those figured in the 3rd vol. of the Pal. N. Y., need be compared. They all differ too widely. Of those mentioned by Professor Hall, in the 14th Annual Report of the Regents of the N. Y. University, *D. anchiops*, *D. armata*, *D. selenurus*, *D. Egeria* and *D. coronata*, seem to be all very distinct from this one. *D. macrops* has 16 lenses in the vertical rows and 34 in the horizontal. In ours the numbers are 12 and 42 as nearly as can be determined. *D. adspetans* has the eye sub-cylindrical with 22 lenses in the vertical line. *D. myrmecophoides* is a huge species allied to the *D. selenurus* type. *D. Boothi* has from 5 to 7 lenses in the vertical rows and 25 in the longitudinal lines in the eye. The other 5 species are described from detached Pygidia.

Locality and Formation. Stair Falls, Maine; Upper Silurian.

GENUS CHEIRURUS, BEYRICH.

The species of this genus are referred to *Ceraurus*, Green, in the New York Reports, but that name is not generally adopted and will most probably fall into disuse.

CHEIRURUS TARQUINIUS, n. sp.

Fig. 22. *Cheirurus Tarquinius*. The head drawn from a specimen collected at Port Daniel on the Bay of Chaleur. This figure is defective in not shewing the punctures on the cheeks.

Description. Head nearly semi-circular, a portion of the front equal to the width of the glabella projecting forwards beyond the general contour; a narrow wire-like rim bordering the cheeks; the posterior angles narrowly rounded (but probably with a spine to each, not preserved in the specimens.) Glabella oblong, rounded and slightly wider in front than behind; sides straight, well defined by the very narrow dorsal furrows; neck-furrow extending all across, in the middle a little curved forwards and partly blended with the posterior pair of furrows. There are three pairs of glabella furrows not reaching the median line; the posterior two furrows curve backwards just before reaching the median line and are obscurely joined by a shallow groove to the middle of the neck-furrow, as before stated; the middle and anterior pairs extend inwards rather more than one-third the width of the glabella, having the median line smooth; all are curved or incline a little backwards. The front lobe of the glabella is transversely ovate, uniformly rounded in front, narrowly rounded or somewhat pointed at the sides; it forms rather more than one-third of the whole glabella. The three other pairs of lobes are about equal, the posterior pair a little the smallest. The glabella is moderately convex, most elevated along the median line and on the front lobe. The narrow elevated rim which borders the cheeks runs round the front of the glabella, but is there much diminished in size and not visible in a vertical view. The cheeks are gently convex and coarsely punctured. The eyes are small and situated in the posterior part of the front half of the cheeks opposite the first pair of glabella lobes behind the front lobe. They are distant about half their own width from the side of the glabella. In none of the specimens is the surface of the glabella preserved, but it appears to be smooth.

The best preserved head of this species that I have seen, is 9 lines in length measured along the median line of the glabella, and 17 lines wide measured on a line crossing through the posterior pair of glabella furrows. Width of glabella on the neck-segment $5\frac{1}{2}$ lines and across the widest part of the front lobe $7\frac{1}{2}$ lines. Distance from the posterior margin of the eye to the neck-furrow where it crosses the cheek $2\frac{1}{2}$ lines. Distance of the inner margin of the eye from the side of the glabella about 1 line. The largest glabella seen is 16 lines in length. These two specimens are from Port Daniel on the Bay of Chaleur, Canada East.

This species is certainly closely allied to *C. insignis*, Beyrich, which, however, differs in the following particulars judging from the figures given by Barrande.* In *C. insignis* the head is proportionally narrower and more uniformly rounded in front. The eyes are not situated quite so far forward, being opposite the second pair of glabella furrows instead of the second lobes. The posterior lobes of the glabella do not extend so far inwards and the posterior glabella furrows are not only further forwards but they are more distinctly confluent with the neck-furrows on the median line.

Locality and Formation. Masardis, Maine. Also at Port Daniel, Canada. Upper Silurian.

. *PRÆTUS JUNIUS*, n. sp.

Fig. 23. *Prætus Junius*. Glabella and Pygidium; the latter enlarged two diameters.

Description. Of this species we have only the glabella and pygidium. The glabella is obtusely conical, the width at the neck-segment about equal to the length; sides in the posterior half gently convex, in the front half somewhat straight and gently converging; front obtusely rounded. The neck-furrow extends all across and the glabella is distinctly defined all round by the narrow dorsal furrow. The margin in front of the glabella is, in width, equal to about one-fifth the whole length of the head; it has a narrow elevated wire-like rim and just inside of this a well defined concave marginal groove equal to the rim in width. Two very obscure indentations representing the glabella furrows are visible on each side, dividing all that portion of the glabella in front of the neck-furrow into three equal portions. These indentations are very indistinct, and on some exfoliated specimens not visible at all. The glabella is moderately convex in the posterior two-thirds, and the contour of the head on a side view, slopes rather suddenly downwards from the middle to the front margin.

The pygidium is short, transversely sub-elliptical, width about twice the length or a little more, the posterior two-thirds broadly and uniformly rounded, the exterior angles narrowly rounded, and the front margin gently convex. The axis is conical, exceedingly convex, with seven well defined articulations which are separated by deep sharp grooves, the first three or four gently undulated backwards on the median line; the first two ribs appear to have a tubercle on each side of the median line. There are six lateral ribs on each side, a small portion of their outer extremities curved backwards, the anterior two obscurely grooved, the posterior two represented by short elevated ridges parallel with the median line but not connected with the axis and not reaching the margin. The axis is a little more than two-thirds the whole length and abruptly elevated at the apex. The margin has a smooth very narrow border.

Width of a perfect pygidium $3\frac{1}{4}$ lines; length $1\frac{1}{2}$ lines. Length of the head of a specimen of which only the glabella and neck-segment and front margin are preserved $3\frac{1}{4}$ lines; length of glabella $2\frac{1}{4}$ lines; width of the same $2\frac{1}{4}$ lines; length of the same including neck-segment $2\frac{3}{4}$ lines.

* BARRANDE in the "Système Silurien du centre de la Bohême," Platte XLI. figs. 1 to 13.

Although there are a number of fragments of this species in the collection, none of them indicate an individual more than 9 lines in length.

Locality and Formation. Square Lake, Maine; Upper Silurian.

PRÆTUS MACROBIUS, n. sp.

Fig. 24. *Prætus Macrobius*. *a*, the head without the cheeks; *b*, side view of the same; *c*, pygidium.

Description. Head semicircular, or nearly so, the width not quite twice the length, the posterior angles produced backwards into short stout spines, the margin with a very thick rounded border. Glabella conical, strongly convex, smoothly arched from the neck-furrow to the front, most elevated in the posterior half, well defined all round by the dorsal furrows which however are not deeply impressed. Neck-furrow extending all across the glabella and apparently also across the base of the cheeks. Neck-segment apparently rounded. On each side of the base of the glabella there is an ovate tubercle with its rounded base bounded behind by the neck-furrow and its pointed extremity directed forwards. These tubercles are separated from the body of the glabella by a pair of narrow grooves which represent the posterior glabella furrows. They originate in the neck-furrow and have a little more than half the width of the glabella between them; thence proceeding forwards and curving gently outwards they cut the dorsal furrows at an acute angle just behind the mid-length of the glabella. In front of them is a pair of obscure lateral grooves which originate in the dorsal furrow at one-third the length of the glabella from its front and run backwards and inwards parallel with the posterior grooves, but faintly marked and becoming obsolete at about the mid-length. The position of the eyes appears to be far back in the head or about opposite the two basal tubercles. The cheeks seem to be tumid but to occupy only a small portion of the head. The smooth space all round the front of the glabella is flat but with a gentle slope outwards.

The pygidium is semicircular, its width at the front margin a little less than twice the length; the anterior margin is gently convex, the outer angles obtusely pointed or very narrowly rounded, scarcely angular; the sides gently convex and the posterior edge uniformly rounded; the axis is strongly convex, acutely conical and with about nine well defined ribs; on the side lobes there appear to be nine or ten ribs which are somewhat flat and have a fine groove along the middle which becomes stronger and deeper on approaching the margin where there appear to be double the number of ribs. The pygidium on a side view is strongly convex, but there is a border all round of about one line in width which is concave.

The following are the proportions as indicated by one of the best preserved specimens. Length of head $7\frac{1}{2}$ lines; width about 12 lines; length of glabella including the neck-segment 5 lines; width of the same on the neck-segment $3\frac{1}{4}$ lines, and at the mid-length about the same. A well preserved pygidium is 5 lines in length and 6 lines in width.

The surface of the thickened border around the head appears to be finely punctured. The glabella is also punctured but the general aspect is smooth. The outer extremities of the ribs of the side lobes of the pygidium become obsolete just at the margin which is however not crenulated by them but has a smooth edge all round.

No specimens with the parts in connection have been found, but several detached cheeks easily identified by the thick rounded border of the outer margin occur. They show that the posterior angles of the head were produced backwards into the short stout spines above mentioned.

Locality and Formation. Square Lake, Maine; Upper Silurian.

BRONTEUS POMPILIUS, n. sp.

Fig. 25. *Bronteus Pompilius*. The thorax restored. The head drawn from a Canadian specimen.

Description. Head moderately convex, nearly semi-circular. Glabella well de-

finer, narrowest on a line crossing through the eyes, thence rapidly widening to the front margin, its sides concave and the front margin obtusely rounded; there are three obscure indentations on each side representing the glabella furrows. Neck-furrow wide and well defined all across the base of the glabella but not continued on the cheeks. Neck-segment most elevated in the middle close to the posterior margin, its surface thence sloping forwards down into the neck-furrow. Eyes of moderate size situated nearly opposite the neck-furrow and about their own length distant from the sides of the glabella.

Pygidium semi-elliptical, its length between two-thirds and three-fourths of its width; fifteen depressed convex ribs. The axis is short, scarcely one fourth the whole length of the pygidium, obtusely conical, with a median line most elevated at the apex; a groove across the front margin.

Surface apparently smooth but under the lens showing fine undulating striæ.

Thorax and posterior angles of the head, unknown.

Length of largest head seen about six lines; width about eleven lines. Length of largest pygidium nine lines; width about eleven lines.

This species resembles *B. Barrande*, Hall. Pal. N. Y., Vol. 3, p. 350, Pl. LXXIII. figs. 1 to 4; but that species is described as having two articulations in the axis of the pygidium. In ours there is a longitudinal median lobe in the axis and a narrow transverse groove close to the anterior margin.

Locality and Formation. Square Lake, Maine; Upper Silurian. Also at Port Daniel on the Bay of Chaleur, and in the Lower Helderberg rocks at Cape Gaspe.

PHACOPS TRAJANUS, n. sp.

Fig. 26. *Phacops Trajanus*. The left side restored. Fig. 27, Pygidium associated with fig. 26.

Description. Head semi-circular, convex; width about twice the length. Glabella depressed convex on the top, becoming gradually more and more elevated from the neck-furrow forwards; front prominent and overhanging the margin; sides nearly straight and well defined to the front of the eye by the dorsal furrows which however are not very deep. Neck-segment rather large and convex; in front of it another transverse segment not so large and terminated at each end at the dorsal furrow by a rounded tubercle. This second segment is separated from the base of the main body of the glabella by a shallow concave furrow which is undulated forwards in the middle. There are three glabella furrows on each side. The most posterior is situated near the base of the main body of the glabella about on a line with the posterior angle of the eye. The second opposite the middle of the eye. These two are curved, the convex side forwards and do not reach the middle of the glabella. The third is near the side of the glabella opposite the front half of the eye and somewhat parallel with the side. The cheeks are tumid in the region of the eye; the posterior portion outside of and behind the eye equal to half the whole width. The neck-furrow crosses the posterior margin of the cheek to a point just outside the eye and then turning a rounded angle of about 90° runs straight forwards and becomes obsolete opposite the front one-fourth of the eye, close to the base it passes. The eye is rather large, sub-hemispherical, not so high as the glabella, its visual surface not a curved plane but rather the segment of a sphere being convex in both directions; i. e. longitudinally and vertically. There are eighteen or nineteen vertical rows of lenses. There are seven lenses in the anterior vertical row, nine in those about the middle and two in the posterior row. The palpebral lobe is crossed by a shallow concave groove which commences at the dorsal furrow close to the upper and anterior angle of the eye and runs backwards and curves round the posterior angle close to the base. Between this groove and the dorsal furrow the cheek is moderately tumid. The lenses of the eye are (or appear to be) perfectly hemispherical and closely arranged being almost in contact with each other; not separated by intervening flat spaces as are the lenses of the eye of some species of *Phacops*. The posterior angle of the eye is

distant about half the length (of the eye) from the groove made by the neck-furrow across the posterior margin of the cheek.

The surface of the head, in the east of the interior, is somewhat smooth but the true surface was probably coarsely tubercled as there is a fragment, of what appears to be a portion of the glabella of this species thus marked in the collection. A small portion of the crust remains on the neck-segment; it is finely tubercled.

Thorax and pygidium unknown.

Length of head 10 lines; width about twice the length. Length of the eye $3\frac{1}{2}$ lines; height of the same (measuring the foretented surface only) $2\frac{1}{2}$ lines; total height 3 lines.

The posterior angles and margins of the cheeks are not preserved in the specimens of which we have only two imperfect heads.

The pygidium associated with this species and supposed to belong to it is $6\frac{1}{2}$ lines in length and about twelve lines in width. The axis cylindro-conical, strongly convex, the apex rounded, $5\frac{1}{4}$ lines in length, 3 lines in width at the front margin, and with ten convex ribs including the half rib in front, the posterior three very small. The side lobes have five well developed ribs and two or three rudimentary ones at the apex of the axis. The longer ribs are grooved along the middle. None of the ribs reach the margin, there being a smooth border all round which is about one line wide at the anterior angles and somewhat narrow behind.

Of the American species of *Phacops* allied to this one, *P. Logani*, Hall, Pal. N. Y., Vol. 3, p. 353, Pl. LXXIII., has the eye situated further back in the head, its posterior angle being almost in contact with the neck-furrow where it is extended across the posterior margin of the cheek. It has only about 100 lenses, whereas in our species there are about 130. *P. Hudsonicus*, Hall, figured on the same plate, has only four lenses in the vertical rows in the middle, but in this species there are nine.

Of the European species *P. fecundus* is more closely allied to ours than are either of the two American species above named. The eye of that species varies remarkably. In the majority of the specimens there are from 116 to 136 lenses, but in others there are from 64 to 108. The number in the vertical rows varies from 4 to 9. The number of the rows from 17 to 22. Barrande considers 19 vertical rows to be the normal number. If we were to be guided by the characters of the visual surfaces of the eyes alone, it would be absolutely impossible to separate any one of the three American species above named from *P. fecundus*. In other respects our species has the second annulation of the glabella (the annulation in front of the neck-segment) more distinctly defined all across, while the front of the glabella is more elevated than it is in the Bohemian form. The pygidia in the two species are almost precisely identical. *P. intermedius*, Bar., is another closely allied species. The eye is of the same form and has from 18 to 21 vertical rows of lenses; usually 9 or 10 in each, but sometimes only 5. The distance between the eye and the posterior margin of the cheek is about the same as it is in our species. The second annulation of the glabella is equally well developed and the pygidium has the same form and number of ribs. The only difference of importance I can perceive, is this. In a vertical view of the head in Barrande's figures one portion of the margin of the head can be seen outside and in front of the eye as there can be in ours. All the other species figured by Barrande are evidently distinct from *P. Trajanus*.

Locality and Formation. Square Lake, Maine; Upper Silurian.

LICHAS ?

Fig. 28. Fragment of a *Lichas*.

This remarkable specimen much resembles a fragment of a plate of a Devonian Fish, but the tubercles and surface between them are smooth; not sculptured like the plates of most ancient fishes. The impression made by the under surface upon the stone as shown in the right hand side of the above figure shows that the under-side is marked by the parallel fissure-like striæ so characteristic of the cast of most

genera of trilobites. The above figure is given for the purpose of directing the attention of collectors to the fossil with the hope that special search may bring to light more of it. Any person living in the vicinity of Square Lake who may happen to find any fragments similar to the above would do much for science by sending it to the Geological Survey of Maine, or the Natural History Society at Portland.

INFLUENCE OF LOCATION ON THE GROWTH OF SHELLS.

By N. T. TRAU, M. D., Corresponding Member.

Sufficient attention has not been heretofore given by conchologists to the subject of location with reference to its influence upon the growth of shells. The result has been, that many specimens have been described as distinct species from a particular locality, whose peculiar characters were the consequence of some local influences.

The common *Lymnea desidiosa*, Say., will completely illustrate my meaning. As seen in the waters east of the Rocky mountains it is a large and elegant shell of a slightly resinous color. Found in the western part of N. England it is of medium size, while as far east as Kennebec County, especially when found in cold springs, it is dwarfish, and assumes a bluish white color. In locations where the water is impregnated with the oxide of iron, the *L. columella* is black, and its lines of growth are obliterated. This has given rise to a new species in the minds of some, *L. chalybea*.

The common clam, *Mya arenaria*, Lin., as found on sandy beaches, is so small and contracted, that fishermen are frequently led to regard it as a distinct species. When found on deltas at the mouth of rivers, they are double the size of those found on beaches, and are apparently largely developed beyond their normal condition. As we advance towards the coast of Labrador they assume dwarfish dimensions. The same shell found as a fossil along the coast of Maine is usually more dwarfish than those found in our waters at the present day.

The *Purpura lapillus*, Lin., so abundant on our shores, is a striking example of the different external appearances of a single species. Probably a dozen different varieties may be collected on our coast, but their mutability in appearance is so obvious that no conchologist will be deceived by them.

The fresh water genus, *Unio*, is a variable shell. As seen in the branches of the Mississippi River, it passes through all the extremes of transverse and longitudinal directions, sometimes assuming the wedge shape form of a *Donax*, and again appearing more like a *Solen ensis*. Seen externally among a collection of marine shells they would not be thought of as a *Unio*. Their internal characters alone decide their relations. The *Unio radiata* is a species widely extended in this country. In still waters it is a beautifully radiated shell; in running water it becomes ponderous and seems like a different species. In chalybeate waters it becomes black externally like most shells in a similar position.

The genus *Physa* is sometimes strangely modified by its location. A remarkable case of this has come under my immediate observation in the *P. ancillaria*, Say. This species is exceedingly abundant in a small millstream running through Monmouth centre, in Kennebec Co. In the little pond just above the gristmill, this shell could be collected in large numbers in 1843, but on passing below the mill to the head of the next mill-pond, not one well characterized specimen could be found. Its place was supplied by what appeared to be a different species. These were described by Dr. Mighels as a new species under the name of *P. fragilis*. But a more familiar acquaintance with the subject has led me to the conclusion that it is only a variety of *P. ancillaria*, and that it has changed its form since the erection of the grist-mill. Formerly it was customary for the miller to throw into the stream large quantities of refuse grain, and chaff, and fowl seed, which floated down and landed in a cove at the head of the next pond which was usually covered with shallow water. The *Physas* residing there had an abundance of rich food which manifested itself by an enormously extended outer lip, and a large deposit of calca-