AUG.-SEPT. 1916

VOL. XXX, Nos. 5 and 6

THE OTTAWA NATURALIST

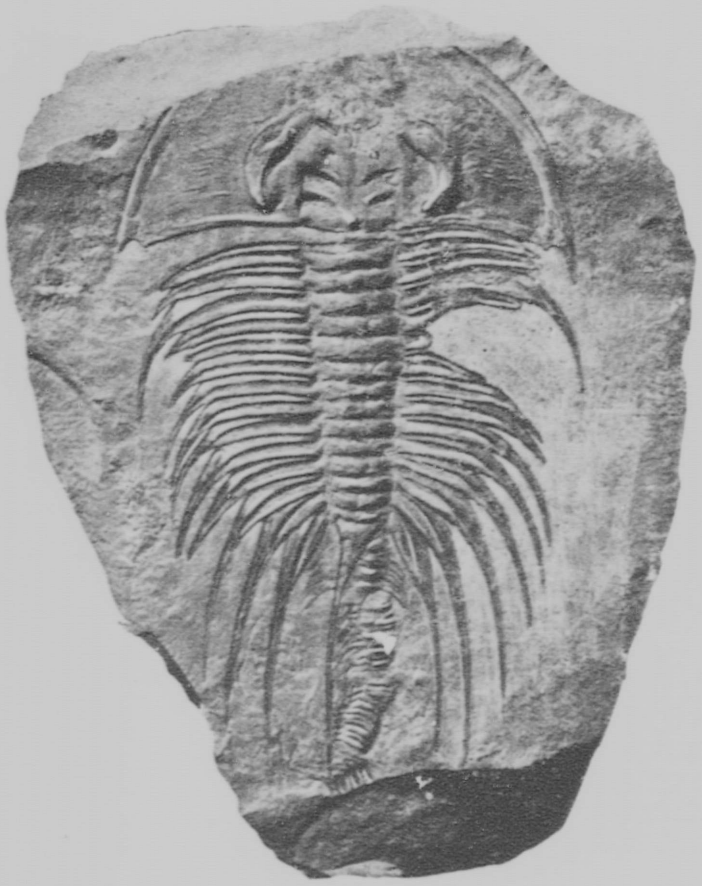
Published by The Ottawa Field-Naturalists' Club

CONTENTS:

THE ROLLA L. CRAIN CO., LIMITED

ISSUED OCTOBER 5th 1916

Entered at Ottawa Post Office as second class matter



(Half natural size.)

Paedeumias robsonensis Burling
Lower Cambrian, British Columbia.

THE OTTAWA NATURALIST

VOL. XXX. OTTAWA, AUG.-SEPT., 1916. Nos. 5 and 6

PAEDEUMIAS AND THE MESONACIDÆ, WITH DESCRIPTION OF A NEW SPECIES, HAVING AT LEAST 44 SEGMENTS, FROM THE LOWER CAMBRIAN OF BRITISH COLUMBIA.(a)

By Lancaster D. Burling.

By common consent we are accustomed to regard the crustacea as derived from the annelids, and we have pointed to their abundantly segmented body as a reason for assigning this ancestorship to them. As late as 1915 (*b*) it was possible, however, to say that there are never less than two nor more than 29 segments in the thorax of a trilobite. Walcott (*c*) has recently described and figured a specimen with 42 normal segments. The specimen to be described contains at least 44 segments (the end is broken away), 29 of which are rudimentary segments posterior to a spine-bearing fifteenth. The great number of segments gives sufficient interest to this trilobite to warrant its description, and a discussion of its bearing on the evolution of the Mesonacidæ.

Paedeumias robsonensis n. sp.

Pædeumias n. sp., Burling, 1916, Bull. Geol. Soc. America, vol. 27, pp. 158-159.

Pædeumias n. sp., Burling, 1916, Geol. Surv. Canada, Summ. Rept. for 1915, p. 100.

Description.—Outline of the cephalon almost semi-circular, marginal rim relatively wide and flat, genal and intergenal spines distinct. Glabella crushed in front, but apparently parallel-sided and reaching in front to the marginal rim. Eyes prominent, broad at the anterior end, where they merge into and even cross portions of the glabella, and narrow at the posterior end which lies just within the posterior margins, is raised, and does not reach the sides of the glabella. Glabellar furrows deeply marked, four pairs being visible in the unmashed portion of the glabella described. The two posterior pairs are almost transverse, and extend two-thirds of the way from the dorsal furrow to the centre of the glabella; the third pair, counting

(*a*) Published by the permission of the Deputy Minister of Mines.
(*b*) Schuchert, Pirsson and Schuchert's Textbook of Geology, 1915, p. 606.
(*c*) Smithsonian Misc. Coll., vol. 64, 1916, p. 162, pl. 26, figs. 4b, 4c.

from the back, is represented on either side by a dimple situated midway between the side and the centre of the glabella, and midway between the furrows anterior and posterior to it. The glabellar furrow nearest the front is a short diagonal groove starting just back of the point of union between the anterior end of the eye lobe and the glabella, and occupying the central portion of the distance from the side to the centre of the glabella. Surface of the cephalon an irregular network of raised inosculating lines more or less radial to the outer margin. Pleurae of two distinct types, an anterior normal set of fourteen and a posterior rudimentary set of 29 (or more, the end is broken away) separated by a spine-bearing segment. The ends of the first fourteen ribs become progressively longer toward the posterior end of the trilobite, and the fourteenth pair almost surround the rudimentary 29. These are further protected by the spine on the fifteenth segment, which is likewise extended. The rudimentary ribs differ little in width of axis from those which precede them, but the sides are very small. Pleural grooves broad, flat, and almost parallel-sided in those forming the middle portion of the trilobite. Toward the spine-bearing fifteenth segment the pleurae become relatively much wider for their length, and the pleural groove cuts more and more diagonally until in the thirteenth and fourteenth it cuts directly across from the anterior inner corner to the posterior outer corner. Rudimentary segments almost plain, pleural grooves being indistinct or wanting. The taper to the 29 rudimentary segments which have been preserved is so gradual as to render it extremely probable that there were many more than 29 segments anterior to the pygidium.

The fourth, fifth, and sixth pleurae on the right side of the specimen described have suffered injury, being broken off close to the axis at such a time or in such a manner that the ends have healed, and show a tendency toward a normal termination. The fifth one in particular is broken clear across, and in it the pleural groove stops just inside of the newly curved margin; the fourth and sixth were broken across transversely so as to leave the greater portion respectively of the upper and lower margins. This particular trilobite is as large or larger than the largest that has so far been discovered in the Lower Cambrian of British Columbia or Alberta. If we assume that the accident occurred during the youth of the trilobite, we must grant that these early forms did not have the power of renewing broken or lost portions, but this conclusion is negatived by its ability to heal up the broken ends and fashion them off. The accident was, therefore, probably of recent occurrence. And since it must have happened during his maturity, we are

somewhat justified in assuming that our trilobite lost this portion of his anatomy to a foe more voracious, if not larger, than himself. The occurrence certainly lends weight to the inference that the Lower Cambrian trilobite was not the supreme arbiter we have supposed him to be; however, he may have been struck by material dislodged from a ledge beneath which he was crawling.

Horizon and Locality.—Lower Cambrian, Mahto formation, collected from drift block on the slope of the Mural glacier just under Mumm Peak, Mt. Robson region, British Columbia. Collected by E. C. Annes.

OBSERVATIONS.—*Paedeumias robsonensis* differs from *P. transitans*—the only other species known—(*a*): (1) in having 29 instead of 2 to 6 rudimentary segments posterior to the spine-bearing fifteenth, and in the more highly developed character of the rudimentary segments—they are better described as small short ribs in *P. robsonensis*, while those of *P. transitans* are truly rudimentary; (2) in having a highly ornamented cephalic surface; (3) in the character of the glabellar furrows, which approach closely to those represented in the cephalon from Mt. Stephen, B.C., doubtfully referred to *Olenellus gilberti* by Walcott (*b*); and (4) in the width and flatness of the marginal cephalic rim.

Paedeumias robsonensis resembles *P. transitans* in general shape and outline, in the number and general character of the normal segments and the pleural furrows, and in the abruptness of the change from regular to rudimentary segments.

These resemblances seem to warrant the inclusion of *Paedeumias robsonensis* in the genus *Paedeumias*, but the differences are such as to justify its reference to a new species. The specific name *robsonensis* is derived from Mount Robson, in whose general vicinity this trilobite was secured.

GENERAL CONSIDERATIONS.—The resorption of segments posterior to the fourteenth or fifteenth in the genera of the Mesonacidæ (a family of trilobites apparently confined to the upper portion of the Lower Cambrian) would seem to indicate that the functioning parts, those necessary for the life of the individual, were confined to the first fourteen. Once this adaptation to fourteen vital segments is made, and *Wanneria* appears to show the trilobite at the moment this took place, resorption of the remainder begins. The finding of 29 rudimentary posterior segments would seem to indicate that this resorption takes place laterally, that is, they become smaller in size before

(*a*) Walcott, Smithsonian Misc. Coll., vol. 53, 1910, pp. 305-310, pls. 24, 25, 32, 33, 34 and 44.
(*b*) Smithsonian Misc. Coll., vol. 53, 1910, pl. 36, fig. 16.

they become fewer in number. Of known genera of the Mesonacidæ, *Mesonacis* and *Paedeumias* have a spine-bearing fifteenth segment, and the progression from the rib-like fifteenth segment of *Mesonacis* through the more rudimentary fifteenth segment of *Paedeumias robsonensis*, and the almost telson-like segment of *Paedeumias transitans* (which cuminates in the telson of *Olenellus*) is paralleled by the progression from the rib-like posterior segments of *Mesonacis* to the less rib-like segments of *Paedeumias transitans*. Moreover, the close relationship of the three genera is shown by the fact that in each the third segment is enlarged. That the number of rudimentary segments alone bears little or no relation to the relative primitiveness of the form is indicated by the fact that *Mesonacis*, which is clearly more primitive than *Paedeumias*, has less than one-third the number of rudimentary segments. *Nevadia*, which appears to be the most primitive as well as the earliest of the Mesonacidæ, does not seem to have reached the stage where differentiation of its segments might take place. In it there is a steady progressive decrease in the length of the pleural groove from the first to the eighteenth, with from six to eleven posterior segments whose pleural portion is unmarked.

In *Elliptocephala* the five segments posterior to the anterior thirteen (not fourteen as in the *Mesonacis-Paedeumias-Olenellus* line) are all spine-bearing, and are identical in everything but size. This feature has only been described for one other form, namely, *Redlichia chinensis*, and while the posterior five segments in this species are spine-bearing and do not otherwise differ from those anterior to them, we have no information as to the number of the anterior segments. It is at least 12 (*a*), however. In *Wanneria* there is a tendency toward nodes or spines on the anterior thirteen segments, and the fourteenth bears a short spine, but except in this respect it is indistinguishable from the progressively smaller segments posterior to it. In this genus there is no suggestion of a resorption of segments, and it seems natural to suppose that *Holmia* may have been derived from it since that genus also betrays no tendency toward resorption, and the anterior fourteen segments only of the sixteen bear spines. In neither *Holmia* nor *Wanneria* is there any enlargement of the third segment.

The fact that there is no enlargement of the third segment in *Nevadia* corroborates the indication given by the character of its ribs, and appears to justify us in believing it to be very primitive. The general resemblance between this genus and species of *Callavia* such as *eucharis* and *perfecta* (*b*) is worthy

(*a*) Walcott, Research in China, vol. 3, 1913, pl. 24, figs. 1, 1a.
(*b*) Walcott, Smithsonian Misc. Coll., vol. 57, No. 11, 1913, pl. 53, figs. 1 and 3.

of note. *Schmidtiellus mickwitzi* (Schmidt) (*a*), with its thirteen segments, absence of any enlargement of the third, and the presence of a spine on the eighth segment, is clearly distinct from *Mesonacis*, but its relationships are obscure. Of the genera in which there is no tendency toward resorption (*Wanneria*, *Holmia*, and *Callavia*), *Callavia* (*b*) alone shows a tendency toward an enlargement of the third segment. The genera showing resorption (*Mesonacis*, *Paedeumias*, and *Olenellus*) all have an enlarged third segment. This is also true for *Ellip. cephala* (*c*), though the differentiation between the third and other ribs disappears in this species in the adult. In *Olenelloides* (*d*), a bizarre survivor of Mesonacidæ, the third segment is enlarged.

The enlargement of the third segment appears to be important from a morphological standpoint, and it is preserved among Middle Cambrian trilobites bearing relationships to the Lower Cambrian Mesonacidæ in the youthful forms of *Zacanthoides* (*e*), and the adult forms of *Albertella helena* (*f*). Its importance in the latter species is, however, largely negatived by the fact that in the very closely related *Albertella bosworthi* (*g*) it is the fourth segment which is enlarged. In both species the total number of segments is the same, seven, but the number of segments uniting to form the tail is larger in *bosworthi* than in *helena*. The second segment is enlarged in the young of the following species of *Paradoxides*: *bohemicus* Boeck, *inflatus* Corda, *lyelli* Barrande, *rugulosus* Corda, and *spinosus* Boeck. In *Hydrocephalus carens*, *H. saturnoides* and *Paradoxides pusillus* Barrande the anterior two segments are enlarged. In *Shumardia pusilla* (Sars) the fourth segment is large, irrespective of the number of segments between the fourth and the tail. In several species of *Cybele* it is the sixth pair, and *Cyphaspis barrandei* and *C. burmeisteri* are each characterized by the presence of a very long median spine on the sixth segment. In one species of *Illaenus* (*hisingeri* Barrande) it is the first. In *Bathynotus* it is the eleventh and last. Median thoracic spines have been described for the following Cambrian species: *Saratogia hera* Walcott (*h*), *Norwoodia tenera* Walcott (*i*), and *N. gracilis* Walcott (*j*). *Zacanthoides*, which has been mentioned as one of the two Middle

(*a*) Moberg in Moberg and Segerberg, 1906, Kongl. Fysiog. Sällskapets Handl., N.F., Bd. 17, 1906, p. 35.
(*b*) Walcott, Smithsonian Misc. Coll., vol. 57, No. 11, 1913, pl. 53, figs. 1 and 3.
(*c*) Walcott, Smithsonian Misc. Coll., vol. 53, No. 6, 1910, p. 269.
(*d*) Peach, Quart. Jour. Geol. Soc. London, vol. 50, pp. 669-670, pl. 32, figs. 1-6.
(*e*) Walcott, Smithsonian Misc. Coll. vol. 53, No. 2, 1908, pl. 3, figs. 5 and 10.
(*f*) Idem, pl. 2, fig. 8.
(*g*) Idem, pl. 1, fig. 5.
(*h*) Smithsonian Misc. Coll. vol. 64, 1916, pl. 35, fig. 3b.
(*i*) Idem, pl. 28, fig. 2d.
(*j*) Idem, pl. 27, fig. 2f.

Cambrian genera showing enlargements of the third segment, includes one species (*idahoensis* Walcott) (*a*) characterized by the presence of a long median spine on the fifth segment, and one species (*typicalis* Walcott) (*b*) in which the median spine adorns the eighth segment. This enlargement of certain segments is comparatively rare among the trilobites, and its further study should yield results of morphologic value. The foregoing can only be considered as a resumé of some of the facts which may contribute "to the observational basis of the ultimate discussion."

A PRELIMINARY PAPER ON THE ORIGIN AND CLASSIFICATION OF INTRAFORMATIONAL CONGLOMERATES AND BRECCIAS.

By RICHARD M. FIELD, AGASSIZ MUSEUM, CAMBRIDGE, MASS.

(Continued from page 52.)

LIMESTONE CONGLOMERATES.

Intraformational conglomerates have been described which are more nearly related to conglomerates in the ordinary sense than those heretofore discussed. The phenoclasts (true pebbles in this case) of these conglomerates are usually of several orders of size, and all but the largest are water-worn, i.e., derived, by transportation and attrition, from indurated, angular material. The pebbles contain the same fossils as are found in the cementing material or ground mass, and thus the conglomerate is proved to be truly intraformational in time. Such conglomerates are of manifold occurrence. Walcott (op. cit. p. 34) describes one from a locality below Schodack Landing, Rensselaer County, N.Y. He writes: "It (the conglomerate) shows that the limestone pebbles, boulders and brecciated fragments were formed from a calcareous sediment sufficiently consolidated to be broken up and more or less rounded by attrition, and these collected to form a bed of conglomerates, the matrix of which is usually calcareous." Sometimes these glomerates are very coarse, and contain phenoclasts the size of boulders (two to four feet in diameter). Walcott describes such conglomerates from eastern Pennsylvania, and others from Tennessee, in Cook, Sevier and Blount counties. In one portion of the Cictico conglomerates, he states (op. cit. p. 38), some of the boulders reach

(*a*) Smithsonian Misc. Coll., vol. 53, No. 2, 1908, pl. 3.
(*b*) Canadian Alpine Journ. vol. 1, 1908, pl. opp. p. 248, fig. 1.

a diameter of six feet. Regarding the origin of the coarse intraformational conglomerates, Walcott writes (op.cit. p. 39: "The relation of the bedded limestone to the subjacent conglomerates proves that the calcareous mud which was subsequently consolidated into the limestones solidified soon after deposition. This is shown by the presence of limestone with sharp, clear-cut edges. The presence of the conglomerates above the limestone beds, from some portion of which they were derived, leads one to believe that the sea-bed was raised in ridges or domes above sea-level, and thus subjected to the action of sea-shore ice, if present and aerial agents of erosion * * *." The mode of occurrence of these boulders, especially those in the limestone at Stone's Quarry, leads to the hypothesis that they may have been dropped upon the sea-bed from floating ice. No other explanation occurs to me that will account for the placing of them upon the sea-bed, so as to not disturb to any marked degree the sediment then accumulating."

MIXED CONGLOMERATES.

A very interesting type of conglomerate which might be classified under B, I, 1, is that described by Raymond (14) from the Lévis. "The Lévis formation consists mostly of shale, with zones of hard blue and light grey limestone, and thick and thin beds of limestone conglomerate. Neither the top nor bottom of the formation is known. * * * Very fossiliferous pebbles have been found in the conglomerates in the Lévis, and the fossils show them to be derived from strata of three geological ages. The pebbles are: 1st, Lower Cambrian; 2nd, Upper Cambrian or Lower Ordovician; 3rd, Beekmantown. Besides the limestone pebbles there are many of igneous rocks and quartzites, but they do not form nearly so large a proportion of the conglomerates as do those composed of limestone. These conglomerates also contain pebbles of the red and green shale and sandstone of the Sillery, thus proving that the Sillery is older than the Lévis, while the *presence of Beekmantown fossils in both pebbles and matrix* of the conglomerates shows that the Lévis is of the same age as the Beekmantown at Phillipsburg, Quebec." According to Walcott's definition these may not be considered as intraformational conglomerates, since the majority of the pebbles are apparently not derived from the strictly subjacent zones of the same formation. Since such a type is not interformational, and since it is intraformational in all other respects, except for the fact that its pebbles are not derived from the same formation, it is believed best to provisionally classify it under B, I, 1. In short, this type of clastic does not postulate any such condition

of unconformity as that represented by a basal conglomerate. Deposition was continuous throughout Lévis time, as shown by the fossils, but the conditions governing the character of the sediments deposited were varied.

CLIFF BRECCIAS.

It is possible that certain intraformational glomerates whose phenoclasts are angular and not rounded are largely made up of cliff breccias. Certain of the unevenly graded glomerates as mentioned above may have had their larger and angular material derived from ridges or domes raised above sea level, as postulated by Walcott.

TECTIBRECCIAS.

For a full discussion of intraformational folds and breccias of tectonic origin the reader is referred to W. J. Miller's paper: "Notes on the Intraformational Contorted Strata at Trenton Falls." The writer's visit to this interesting locality convinced him of two important facts. Firstly, that the "contortions" and breccias had taken place most characteristically in zones where deposition of sediments had been varied and alternating. Secondly, breaking down of the folds was, locally, very pronounced; extreme overthrusts of the hardened or purer limestone layers resulting in the formation of edgewise breccias contained in a greatly crushed and squeezed but structureless mass of shale. It seemed obvious from a personal examination of this phenomenon, that the thin limestone bands must have been well indurated before they were brecciated, and that the interbedded, shaly limestones, because of their composition, took up the thrust in such a way as to show little or no contortions or folds, such as is shown in the stringers of brittle limestone contained within them. The general overthrust phenomena exhibited in the more massive beds of the Trenton formation and their association with the nearby Prospect fault, seem to point conclusively to the tectonic origin of the contortions and breccias. Intraformational breccias of this type are not to be confounded with Fault breccias or Crush conglomerates. They are to be expected in those portions of a formation which have undergone varied conditions of deposition and subsequent exogenic deformation. As intraformations they are interstratified with the formation in which they occur, and are never found in cross-cutting position. It is also interesting to note that the phenoclasts of such glomerates should be of a different composition and texture from the matrix.

ICE-FORMED GLOMERATES.

It is possible that icebergs and glaciers may have featured in the formation of intraformational glomerates. The shoving

force or push and drag of a glacier has been supposed to have produced folding and overthrusting in the partly consolidated Pleistocene clays which it overrode. A single case has been mentioned by Sardeson (15) in which the loosening of subjacent limestone strata consequential to glaciation, has produced a local brecciation. This case is not intraformational under Walcott's definition, as the beds in question are Paleozoic in age, but it is conceivable that the glaciation of certain surfaces might have produced true intraformational breccias. It has been supposed that the close and peculiar folding in certain Pleistocene clays and delta deposits is the result of "drag" by grounding icebergs. Whether or not these folds owe their origin to such a cause, it is probably doubtful if intraformational breccias could be formed in this way, owing to the peculiar consistency of the sediments. The argument here against brecciation as a result of intense folding and overthrusting is much the same as in the case of subaqueous-gliding-deformation in clay deposits.

CONCLUSIONS.

The attempt has been made in the foregoing pages to classify intraformational glomerates according to their possible as well as probable origin. It is fully realized that the classification is merely preliminary in its scope, and no attempt has been made to cover all the literature on the subject. The thesis has been to emphasize the importance of certain textures and structures, especially in limestones, and to suggest that their systematic study may lead to a more comprehensive view of the history of the seas from and under which they were deposited. Walcott was the first to define the difference between intraformational and interformational conglomerates. His paper is important as it deals with the origin and deposition of limestones, and points the way to a more careful consideration of unconformity and disconformity in the field. Wherever the stratigrapher finds a change in the structure of the zones, no matter how superficial such change may at first appear, he should be on his guard for a probable change in the conditions of deposition and all the attendant geological phenomena, which may hypothetically be the *cause* of such a change. It has been pointed out that the usual rock section, as exposed by streams and roads, is apt to give little or no evidence of important structural phenomena, such as ripple-marks, mud cracks, etc. Under certain conditions intraformational limestone glomerates are very difficult to detect in the field, owing to the more or less homogenous composition of the phenoclasts and cement. The relation of intraformational zones to fossiliferous zones is of great significance in the study of limestones, and it has been found

FIGURE 1.

FIGURE 2

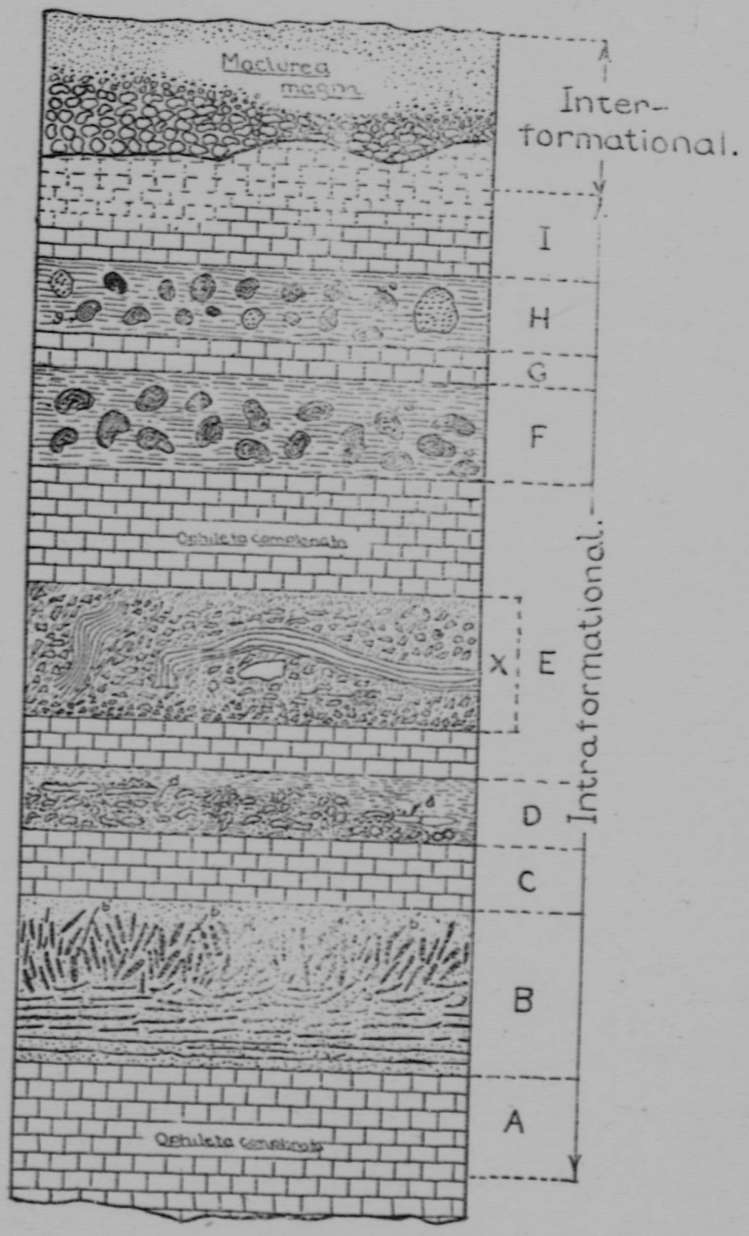

Maclurea magna
Inter-formational.
I
H
G
F
Orbiculoidea
X
E
D
C
B
A
Intraformational.
Orbiculoidea

FIGURE 3.

that it is sometimes a good deal easier to discover the fossiliferous zones in the Beekmantown than the glomerates subjacent to them. The study of intraformational glomerates includes a careful examination of the phenoclasts and cement as well as the structure and field relations of the strata above and below the zone in question. The examination of the texture, shape and composition of the phenoclasts and cement is mainly petrographic in its nature, and upon it will largely depend the plausibility of the students' views as to origin.

Certain liberties have been taken with Walcott's original definition of intraformational conglomerates. This was deemed necessary for two reasons: first, because some of the types discussed by Walcott are not typically conglomeratic (in the geological sense); second, because the term is such a useful and necessary one in stratigraphy that it should be applicable to an important group of clastics intimately associated with the history of the Palæozoic and Mesozoic seas. Whether or not it will ultimately be deemed advisable to group such rocks as tectibreccias, bioglomerates and edgewise conglomerates under the term intraformational is open for discussion. The attempt has been made to list and classify certain clearly, as well as obscurely, defined examples of limestones, with the hope that this systematic study may help in reaching the ultimate goal—the history and origin of the calcareous terrains of the world.

DESCRIPTION OF FIGURES.

FIGURE 1.—Diagramatic sketch of a supposed bioglomerate from the lower Beekmantown limestone at Bellefonte, Penna. The large phenoclast on the right hand side of the figure shows structure which may be organic in origin. Most of the phenoclasts present peculiar outlines not at all similar to the outlines of the pebbles in an ordinary conglomerate. The small dots are supposed to represent agal-like organisms which have worked their way into the soft limy material and broken it up into the characteristic shapes shown in the diagram. The phenoclasts are fine grained, and sometimes contain fragments of small fossils. Most of the fossils, however, are found in the more granular ground mass.

FIGURE 2.—This figure is illustrative of an actual specimen of mud-cracked limestone found in one of the quarries at Bellefonte, and illustrates on a smaller scale the phenomena exhibited on the east wall along the strike of the quarries from Bellefonte to Tyrone, Pennsylvania. The shaded lines on the surface, traversed by the two parallel calcite veins, represent mud-cracks. Viewed in section the structure is that of a typical stratified glomerate. The figure is supposed to illustrate the

two principal factors controlling the formation of such a glomerate:

1. Alternation of the conditions of deposition.
2. Dessication.

Figure 3 of this article is a diagramatic summary of the argument for a classification of sedimentary rocks, and especially of intraformational glomerates, according to the sequence of formative events which they have undergone. The figures are more or less diagramatic, and no attempt has been made to draw an accurate picture of each type. The reader may consult the various descriptions for accurate illustrations. Seven types of glomerates are represented in the columnar section, six intraformational and one interformational. In order to make the comparisons of the six intraformational glomerates relatively the more graphic, they are all supposed to have formed within a single formation, characterized by the index fossil *Ophileta complanata*.

Beginning with *A* time, we have deposition of pure limestone until *B* time, which commences with alternating deposits of pure and shaly limestone, followed by mud-flat conditions with dessication and the formation of mud-crack zones or stratified breccias. Here the phenoclast *b* is practically of the same age as the cement or matrix. During the rest of *B* time, marine currents are dominant and form edgewise glomerates, whose phenoclasts of the *b'* type have been carried a short distance and slightly abraded, so that they are slightly older in relation to their matrix than those of the *b* type. From the close of *B* time to the beginning of *D* time, pure, structureless limestone is laid down. During *D* time conditions are favorable for the formation of bioglomerates. Here again, as in the case of early *B* time, the phenoclasts are formed in place, and are practically contemporaneous with the cement. Through *E* we have a period of pure limestone deposition, except during the middle when shale was formed interstratified with the limestone. In *F* time we have the formation of a limestone conglomerate whose phenoclasts *e* are true water-worn pebbles derived from the subjacent zone *E*. Obviously the pebbles of this conglomerate were formed long before they were deposited, and long before the ensuing lithification of the mass. Compare the pebbles of this type with the phenoclasts of the preceding types. During *G* time there is a short period of pure limestone deposition, followed by a period characterized by conglomerates of the mixed type, certain of whose pebbles contain the same fossils as the cement (*Ophileta complanata*), proving that the conglomerate is truly intraformational in character. *I* time sees the close of the period characterized by *O. complanata*. Uplift and erosion

result in a basal conglomerate resting with unconformity on older strata, and succeeded by sandstone and limestone in which occur *Maclurea magna*.

Long after the deposition and lithification of the formation described, and perhaps of several succeeding ones, tectonic forces cause the deformation of the sub-zone X in the zone *E*. Obviously the age of the phenoclasts in this tectibreccia is much younger than the ages of any of the phenoclasts heretofore discussed, whether they are intraformational or even interformational. Finally, it is a fact that not all the types described can be distinguished in the field at a glance. Type *X* may be easily confused with gliding deformation structures; type *D* with type *F*, etc.

BIBLIOGRAPHY.

1.—Walcott, C. D.,: "Paleozoic Intraformational Conglomerates." Bull. Geol. Soc. Am., 1894, 5, p. 191.

2.—Grabau, A. W.: "Principles of Stratigrapy," N.Y., 1913.

3.—Hahn, F.F.: "Untermeerische Gleitung bei Trenton Falls (Nord Amerika) und ihr Verhaltniss zu Ahnlichen Storungsbildern. Neues Jahrbuch fur Mineralogie, etc. Beilage Band XXXVI, pp. 1-41, taf. 1-3, 1912.

4.—Miller, W. J.: "Notes on the Intraformational Contorted Strata at Trenton Falls." Report of the Director of the N.Y. State Museum for 1914, 1915.

5.—Kindle, E. M.: "Columnar Structure in Limestone." Museum Bull. 2, Canada Dept. Mines Geol. Sur. 14, 1914.

6.—Hyde, J. E.: "Dessication Conglomerates in the Coal Measures Limestone of Ohio." Am. Jour. Sci. XXV, 1908, p. 400.

7.—Seeley, H. M.: Report of the Vermont State Geologist for 1906, pp. 174-178.

8.—Brown, T. C.: "Notes on the Origin of Certain Paleozoic Sediments. Illustrated by the Cambrian and Ordovician Rocks of Centre County, Penna." Jour. Geol. XXI, 3.

9.—Seeley, H. M.: Report of the Vermont State Geologist for 1901-1902, p. 153.

10.—Sardeson, F. W.: "Characteristics of a Corrosional Conglomerate." Bull. Geol. Soc. Am, 25, 1914, p. 271.

11.—Wallace, R. C.: "Pseudo-brecciation in Ordovician Limestone in Manitoba.

12.—Walcott, C. D.: "The Cambrian Rocks of Penna." Bull. 134, U.S.G.S., 1896.

13.—Agassiz, A.: "Three Cruises of the . . . . Blake," vol. 1, p. 87, 1888.

14.—Raymond, P. E.: Excursions of the 12th International Congress, 1913. Guide Book 1. Excursion A 1, part 1, p. 29.

15.—Sardeson, F. W.: "The Folding of Subjacent Strata by Glacial Action." Jour. Geol. XIV. (p. 226), April-May, 1906.

ANOTHER NESTING SITE FOR THE PRAIRIE WARBLER IN ONTARIO.

BY W. E. SAUNDERS, LONDON, ONT.

The Prairie Warbler (*Dendroica discolor*) is one of the rarest and most casual migrant visitors to Ontario, and the only hint of a breeding station in this province was the one obtained when I found a few singing males near the tip of the Bruce Peninsula in 1900.

On the 14th of June this year I was at Port Franks (at the south-east corner of Lake Huron), in company with Mr. N. Tripp, of Forest. Early in the morning Mr. Tripp took me across the river to a region where he found two birds which he took to be Prairie Warblers, on June 14th, 1915, and as soon as we reached the locality we heard the characteristic song of this bird, consisting of ten or twelve very short notes, rising not more than two tones in the whole song, the notes resembling a wheezy whistle.

The location was within two or three hundred yards of the lake shore, where most of the surface was sand, with scattering vegetation, but the warbler was singing from an island of juniper, with a few white and red pines and birch, the mound rising to perhaps thirty feet in height, and the top of it being something like thirty or forty feet across. After watching him sing in a red pine at very short range, where he was feeding, he flew sixty yards to another similar island, where he sang again.

The next morning I investigated the locality more thoroughly, and found at least two other males singing, but nothing more was learned of their business in this locality, though the date is an acceptable proof that they were on their breeding ground.

The country along the lake shore for several miles each way is similar to that where these birds were found, and it is probable that extended investigation will disclose the presence of a breeding colony of some moment. On the west side of the river mouth, in a grassy marsh, were a number of pairs of the Short-billed Marsh Wren, but outside of these two species nothing rare was seen in the two days which I spent at the Port.

There were no White Throats, Juncos, Northern Thrushes, no Olive-sided Flycatchers, all of which are supposed to nest in small numbers in that district; nor did I find either Broad-winged nor Sharp-shinned Hawks, which were the object of the expedition.

The Yellow Lady's Slipper was growing near the Short-billed Marsh Wren colony, on the open prairie-like land, in exactly similar conditions to those under which I have found

it on the Alberta prairies. The Blue-eyed grass (*Sisyrinchium*) was in thousands on the same territory, while in the shaded sand under the pine trees blue lupines occurred by the acre. White variants of the latter were common, and one such was seen of the *Sisyrinchium*. This district is a very interesting one to the botanist, and I have a feeling of fresh surprise on every visit to find the tulip tree and the red pine growing together. In the autumn of last year I visited this district, and was delighted in the great quantity of *Liatris* flowering in the woods. Owing to the fact that a great deal of the latter is wild, and also that cattle are absent, many unusual plants are found in comparative profusion.

BOOK NOTICE.

"CONSERVATION OF FISH, BIRDS AND GAME," issued by the Commission of Conservation. This volume is a report of the proceedings of a conference of the Committee on Fisheries, Game and Fur-bearing Animals of the Commission, and contains a fund of information regarding the present condition and the necessity for protection of Canada's fish, birds and mammals.

Canada is taking a prominent part in the international movement for the protection of wild life. A Migratory Bird Treaty between Canada and the United States is under consideration. Through the influence of the Commission of Conservation and other interests, bird reservations are being created, where the birds may find safe nesting and breeding places.

The fur-bearing animals of Northern and Western Canada are being rapidly exterminated. This is clearly shown by the present report. To secure their more adequate protection, the Commission is advocating the amendment of the Northwest Game Act to place responsibility for its administration upon the Dominion Parks Branch, which already protects the animals in the Dominion National Parks.

The future of the fisheries of Canada is dealt with in an able manner. That they are of great present value is recognized, but there is also a potential value in our oceanic and inland waters which, upon development, would mean the creation of new industries. To meet this condition the Commission is suggesting vocational training and simple demonstration stations for the fishermen, that they may take advantage of the most practical and modern methods of their calling.

The report is replete with illustrations applicable to the subject matter.

The Ottawa Field-Naturalists' Club.

Patron:

HIS ROYAL HIGHNESS THE DUKE OF CONNAUGHT,
GOVERNOR-GENERAL OF CANADA.

Council 1916-17

President:

Mr. Harlan I. Smith.

Vice-Presidents:

Dr. C. Gordon Hewitt. Mr. E. D. Eddy, B.S.A.

Secretary:

Mr. L. D. Burling.
(Victoria Memorial Museum).

Treasurer:

Mr. G. LeLacheur, B.S.A
(Seed Branch, Dept. of Agriculture)

Editor:

Mr. Arthur Gibson.
(Entomological Branch, Dept. of Agriculture)

Librarian:

Mr. J. R. Dymond, B.A
(Seed Branch, Dept. of Agriculture)

Dr. M. Y. Williams.
Mr. P. A. Taverner.
Mr. L. H. Newman.
Dr. M. O. Malte.
Mr. F. W. Waugh.
Mr. H. B. Sifton, M.A.
Mr. C. M. Sternberg.
Miss F. Fyles, B.A.
Mr. H. McGillivray

Past President:

Mr. Arthur Gibson.

Standing Committees of Council:

Publications: Dr. C. G. Hewitt, A. Gibson, J. R. Dymond, L. D. Burling, E. D. Eddy,

Excursions: F. W. Waugh, E. D. Eddy, Dr. M. Y. Williams, J. R. Dymond, G. LeLacheur, H. McGillivray, H. B. Sifton, C. M. Sternberg, Miss F. Fyles,

Lectures: Arthur Gibson, Dr. C. G. Hewitt, Dr. M. Y. Williams, L. H. Newman, P. A. Taverner, L. D. Burling.

Leaders at Excursions:

Archæology: H. I. Smith, F. W. Waugh, W. J. Wintemberg, T. W. E. Sowter, J. Ballantyne.

Botany: W. T. Macoun, J. M. Macoun, L. H. Newman, Dr. M. O. Malte, Miss F. Fyles, J. R. Dymond, E. C. Wight, H. B. Sifton.

Entomology: A. Gibson, W. H. Harrington, Dr. C. G. Hewitt, J. M. Swaine, F. W. L. Sladen.

Geology: Dr. E. M. Kindle, Dr. M. Y. Williams, H. McGillivray, L. D. Burling, E. Poitevin, Dr. M. Wilson, C. M. Sternberg.

Ornithology: C. Patch, P. A. Taverner, Dr. M. Y. Williams, A. G. Kingston, A. E. Kellett.

Zoology: A. Halkett, E. E. Lemieux, E. A. LeSueur, C. H. Young.

Auditors:

J. Ballantyne. E. C. Wight.

Membership Fee to O.F.N.C., with "Ottawa Naturalist," $1.00 per Annum.