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THE

CANADIAN

NATURALIST AND GEOLOGIST.

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ARTICLE XXXVII.—*A Systematic List of Lepidoptera collected in the vicinity of Montreal.* BY W. S. M. D'URBAN.

On my arrival in England, in the autumn of 1859, I placed the whole of the Canadian *Lepidoptera* I brought home with me, in the hands of Mr. Francis Walker, so well known for his attention to this order of Insects, and the author of the British Museum Catalogues of Lepidoptera Heterocera. He has lately returned my specimens to me carefully named, and has generously placed at my disposal his valuable descriptions of the new species for publication in the "Canadian Naturalist and Geologist."

Being persuaded that local lists are indispensable for a right understanding of the geographical distribution of the animals and plants of every country, I have drawn up a catalogue of those Lepidoptera which were taken in the neighbourhood of Montreal. The number of species (162) is, I am aware, but small, and the greater portion of them were taken during the first few months of my residence in Canada. I trust that others may be induced to turn their attention to this interesting order, and to form longer lists than the present, which, however, may be useful as the first step towards the much to be desired result of a complete catalogue of Canadian Lepidoptera. I think it is Agassiz, who says somewhere, that "a hitherto unrecorded locality for a species accurately determined, is as great an addition to science as the discovery of a new species."

In June and July thousands of Noctuidæ may be taken by treacle spread on tree-trunks at night, and all the families of Heterocera swarm in lighted rooms when the windows are opened. If any one would take the trouble to catch and pin these or any other insects, and send them home to the British Museum, they would be thankfully received and acknowledged, and the new species would be described at length in the Catalogues, a large number of which have been already published. The late lamented Dr. Barnston presented numerous specimens from the Hudson's Bay Territories to that national institution, and it is greatly to be wished that others would follow his example. These specimens were collected by George Barnston, Esq., the father of Dr. Barnston.

A very large proportion of the Canadian genera are identical with the European, many of the species being also exactly similar, and to such I have affixed the mark (Eu).

The present Catalogue is carried as far only as the conclusion of the *Pyralideous Pyralidina.* I have handed over to Mr. Stainton the few Micro-Lepidoptera I collected, and he informs me that there are some interesting species amongst them, and that others are very similar to English forms. Several fine *Sphinges* captured near Montreal are in the collection of the Natural History Society, but their names are unknown to me.

Wishing to give an idea of the distribution of the species throughout America, I have added the localities where they have been recorded as occurring, as far as I have been able to ascertain from various sources, but principally from the British Museum Catalogues of Lepid. Het., to the end of the *Noctuina*, and in a few instances amongst the *Geometrina* and *Pyralidina.* Having had access to but few works, and but limited time in which to accomplish my undertaking, being just about to sail for the Cape of Good Hope, it is necessarily very incomplete, and I must claim indulgence for any errors of omission and commission of which I have been guilty.

Exeter, Devonshire, May 1860.

RHOPALOCERA, *Boisd.*

Family I. PAPILIONIDÆ, *Leach.*

Sub-Family I. PAPILIONIDI, *Steph.*

Genus 1, PAPILIO, *Linn.*

1. P. Asterias, *Fab.*, (Black Swallow-tail).—Abundant, June to September.

Distribution.—West Indies, S. America, Georgia, Virginia, (Boisd.); Massachusetts, (Harris); New York, (Emmons); Ohio, (Kirtland); Newfoundland, (Gosse); does not occur in the Eastern Townships, at Sorel or Quebec (?)

2. P. Turnus, *Linn.*, (Tiger Swallow-tail).—Common, May to end of July.

Distribution.—Virginia, Georgia, Carolina, (Boisd.); Newfoundland to Mexico, (Gosse); Massachusetts, (Harris); New York and Maine, (Emmons); Ohio, (Kirtland); Eastern Townships, Sorel, Rouge District, Quebec and Southern shores of the Gulf.

Sub-Family II. PIERIDI, *Steph.*

Genus 2, Colias, *Fab.*

1. C. edusa, *Fab.*, (Clouded Yellow).—One specimen, September 10th 1856.

Distribution.—New York, (Boisd.); (Eu).

2. C. Philodice, *Godt.*, (Clouded Sulphur).—Very abundant, June to October.

Distribution.—Throughout North America.

Genus 3, Pieris, *Schrank*; Pontia, *Fab.*

1. P. oleracea, *Harris*, (Grey-veined White).—Not very numerous, May and June, August and September.

Distribution.—Lake Superior, (Agassiz); Wisconsin and Ohio, (Kirtland); Massachusetts, (Harris); Eastern Townships, (Gosse); Upper Canada, Rouge District, Quebec and Southern shores of the Gulf. *P. Casta,* Kirby, a variety of this species occurs in the Hudson's Bay Territories.

2. P. Protodice, *Boisd.*, (see C. N. and G. vol. II, p. 347, pl. VI, figs. 3, 4, 5).—Lachine, (Dr. Barnston).

Distribution.—New York, (Boisd.); Rochport, Ohio, (Kirtland); Connecticut.

Family II. HELICONIDÆ, *Swainson.*

Genus 1, Danais, *Boisd.*; Euplœa, *Fab.*

1. D. Archippus, *Fab.*, Plexippus, *Cramer*, (Storm Fritillary); Common, June to August.

Distribution.—West Indies and Middle States, (Boisd.); South Carolina, (Abbot); Massachusetts, (Harris); Philadelphia, (Say); New York, (Emmons); Ohio, (Kirtland); Lake Superior, (Agassiz); Eastern Townships, (Gosse); Upper Canada, Rouge District, and Sorel.

Family III. NYMPHALIDÆ, *Swainson.*

Sub-Family I. SATYRIDI, *Steph.*

Genus 1, Debis, *Doubleday?*

1. D. Portlandia, *Boisd.*, Oreas-marmorea Andromacha, *Hubner*, (Pearly eyes).—Not common, July.
   Distribution.—Western Prairies of Ohio, (Kirtland); Arkansas, but not in Pennsylvania, (Say); Massachusetts, (Harris); Eastern Townships, (Gosse) Rouge District.

Genus 2, Hipparchia, *Fab.*; Satyrus, *Boisd.*

1. H. Nephele? *Kirby.*—Common in grass-fields, July and August.

Sub-Family II. NYMPHALIDI, *Steph.*

Genus 3, Limenitis, *Fab.*

1. L. Arthemis, *Drury*, (Banded Purple).—Common, July and August.
   Distribution.—Eastern Townships, (Gosse); Massachusetts, (Harris); Poland, Ohio, (Kirtland); Lake Superior, (Agassiz); North-West Territory, Lake Winipeg, Lake of the Woods, Upper Canada and Arkansas, (Say); Sorel, Rouge District, and South side of the Gulf.

Genus 4, Nymphalis, *Boisd.*

1. N. disippus, *Godt.*; Missippus, *Linn* and *Fab.*—Common, August.
   Distribution.—New York, (Environs); Massachusetts, (Harris); Ohio, (Kirtland); L'Orignal, on the Ottawa, (Bell).

Sub-Family III. VANESSIDI, *Steph.*

Genus 5, Cynthia, *Fab.*

1. C. cardui, *Linn*, (Painted Lady).—Abundant in some years, September and October.
   Distribution.—Massachusetts, (Harris); New York, (Emmons); Rochport, Ohio, (Kirtland); South shores of the Gulf and New Brunswick, (R. Bell); Sorel, (Eu.)
2. C. Huntera, *Fab.*, (Hunter's Cynthia).—Abundant on the Mountain, October 1850, (Billings).
   Distribution.—Massachusetts, (Harris); Rochport, Ohio, (Kirtl and)

Genus 6, Vanessa, *Fab.*

1. V. Atalanta, *Linn*, (Red Admiral).—Rare, though abundant at Sorel.
Distribution.—Massachusetts, (Harris); Ohio, (Kirtland), (Eu.)

2. V. Antiopa, *Linn*, (Camberwell Beauty).—Extremely abundant, March to October.
Distribution.—Massachusetts, (Harris); Ohio, (Kirtland); Southern shores of the Gulf; (Bell); Eastern Townships, (Gosse); (Eu.)

3. V. Milberti, *Godt.*; furcillata, *Say*, (Forked).—Common, May to September.
Distribution.—Massachusetts, (Harris); Rockport, Ohio, (Kirtland); Eastern Townships, (Gosse); North-West-Territory, (Say); Rouge District.

4. V. J. album, *Boisd.*, (Compton Tortoise).—Common, Spring and Autumn.
Distribution.—Rockport, Poland, Ohio, (Kirtland); Lake Superior, (Agassiz); Eastern Townships, (Gosse); Gaspé District, (R. Bell); Rouge District and Sorel.

Genus 7, Grapta, *Kirby.*

1. G. Progne, *Fab.*, (Green Comma).—Abundant, May to September.
Distribution.—Rockport, Ohio, (Kirtland); Massachusetts, (Harris); Eastern Townships, (Gosse); Southern shores of the Gulf, (R. Bell); Rouge District

2. G. C. album, *Godt.*, (Orange Comma).—Not common.
Distribution.—Eastern Townships, (Gosse); Rouge District.

Sub-Family IV. Argynnidi, *Steph.*

Genus 8, Argynnis, *Fab.*

1. A. Aphrodite, *Fab.*, (Silver-spot Fritillary).—Common, July to September.
Distribution.—New York, (Emmons); Massachusetts, (Harris); Ohio, (Kirtland); Lake Superior, (Agassiz) Eastern Townships, (Gosse); South shores of the Gulf, (R. Bell); Niagara and Sorel.

2. A. Cybele, *Fab.*, (Great spangled Fritillary).—Not so common, Aug.
Distribution.—Eastern Townships, (Gosse).

Genus 9, Melitœa, *Fab.*

1. M. Myrina, *Cramer*, (American Pearl-border Fritillary).—Not very common, June to August.
Distribution.—As far South as Florida, and North as Massachusetts, (Say); Ohio, Wisconsin and Connecticut, (Kirtland); Lake Superior, (Agassiz); Eastern Townships, (Gosse); South side of the Gulf, (R. Bell); Rouge District.

2. M. Tharos, *Cramer*; Cocyta, *Hübner*, (Pearl-crescent Fritillary).—Very abundant, June to August.

Distribution.—Massachusetts, (Harris); Ohio, (Kirtland); Lake Superior, (Agassiz); Eastern Townships, (Gosse); South side of the Gulf, (R. Bell); Rouge District.

Family IV. LYCÆNIDÆ *Leach.*

Genus 1, Thecla, *Fab.*

1. T. Niphon? *Hübner.*—Sorel and perhaps Montreal, May: (several other species undetermined.)

Genus 2, Chrysophanus, *Hübner*; Lycæna, *Fab.*; Polyommatus, *Boisd.*;

1. C. Americana, *Harris*, (American Copper).—Common, August.
   Distribution.—Massachusetts, (Harris); Ohio, (Kirtland); Eastern Townships, (Gosse); Rouge District and Sorel.
2. C. Thoe? *Boisd.*—Lachine, (Barnston).
   Distribution.—Rockport, Ohio, (Kirtland).

Genus 3, Polyommatus, *Latr.*; Lycæna, *Boisd.*

1. P. pseudargiolus, *Boisd.*; Lucia, *Kirby*, (Spring Azure).—Not very common, May and June.
   Distribution.—Massachusetts, (Harris); Rockport, Ohio, (Kirtland); Eastern Townships, (Gosse); Latitude, 54° North, (Kirby); South side of the Gulf, (R. Bell); Rouge District.
2. P. Comyntas, *Godt.*—Lachine, (Barnston).
   Distribution.—Rockport, Ohio, (Kirtland).

Family V. HESPERIDÆ, *Leach.*

Genus 1, Eudamus, *Swains.*

1. E. Tityrus, *Fab.*; Clarus, *Cramer.*—Numerous, 1858, (Mr. Fowler).
   Distribution.—Massachusetts, (Harris); Ohio, (Kirtland).

Genus 2, Pamphila, *Fab.*

1. P. cernes, *Boisd.*, (Tawny-edged Skipper).—Not uncommon.
   Distribution.—Eastern Townships, (Gosse); and several undetermined species.

HETEROCERA, *Boisd.*

Group 1. SPHINGINA, *Stainton.*

Family I. SPHINGIDÆ, *Leach.*

Genus 1, Smerinthus, *Latr.*

1. S. geminatus, *Say*; cerisii, *Kirby*, (Twin-eyed Hawkmoth).—Not uncommon.
   Distribution.—Massachusetts, (Harris); Orillia, C.W., (Bush.); Eastern Townships (Gosse); Sorel.
2. S. myops, *Abbot & Smith.*—Rare.
   Distribution.—United States, (Doubleday).

Genus 2, Sphinx, *Linn.*

1. S. drupiferarum, *Abbot and Smith.*—Common, June and July.
   Distribution.—United States.

Genus 3, Deilephila, *Och.*

1. D. Galii, *Fab.*; Chamænerii, *Harris*; Intermedia, *Kirby*, var.; Sphinx Epilobii, *Harris*.—Abundant on Lilac Blossoms, June.

Distribution.—New Hampshire, (B. M. C.); Lake Superior, (Agassiz); Massachusetts, (Harris); Orillia, C.W., (Bush); York Factory, Hudson's Bay Territories, (Dr. Rae); Sorel, (Eu.)

Family SESIIDÆ *Steph.*

Genus 1, Sesia, *Fab.*

1. S. Thisbe, *Fab.*; Pelasgus, *Cramer & Harris*; ruficaudis, *Kirby*, var. —Not uncommon, July and August; flies by day.

Distribution.—New York, (Doubleday); Massachusetts (Harris); New Jersey, (Kirby); Orillia, C.W., (Bush.); Eastern Townships, (Gosse); Sorel.

2. S. diffinis, *Boisd.*—Not uncommon in gardens on hot days in July.

Distribution.—United States, (Doubleday); Orillia, C.W., (Bush.); St. Martin's Falls, Albany River, Hudson's Bay, (G. Barnston); Sorel.

Family CASTNIIDÆ, *Swains*; AGARISTIADÆ, *Harris.*

Genus 1, Alypia, *Hübner.*

1. A. octomaculata, *Fab.*—Not very common, June, (August, Gosse). "The Canada *A.* 8-*maculata* differs generally from those of the United States, in having smaller spots and less distinct blue streaks in the fore-wings, and it has no trace of the basal spot in the hinder wings."—Walker, Brit. Mus. Cat. Lepid. Het., Part I, p. 60.

Distribution.—Georgia, United States, and Nova Scotia, (B.M. C. at); Eastern Townships, (Gosse).

Group 2. BOMBYCINA, *Stainton.*

Family. HEPIALIDÆ, *Steph.*

Genus 1, Hepialus, *Fab.*

1. H. argenteomaculatus, *Harris.*—Not common, July.

Distribution.—Massachusetts, (Harris); Lake Superior, (Agassiz) Eastern Townships, (Gosse): Sorel.

Family. ZEUZERIDÆ, *Boisd.*

Genus 1, Cossus, *Fab.*

1. C. plagiatus, *Walker.*—Rare, July.

In 1857, Mr. T. R. Peale, of the United States Patent office, named this species *Cossus McMurtrici*, and informed me that it was common South of Pennsylvania, but rare in the Middle States."

Family. NOTODONTIDÆ, *Steph.*

Genus 1, Datana, *Walker*; Eumetopona, *Fitch.*

1. D. ministra, *Drury.*—Larvæ abundant in camps on trees, August and September.

Distribution.—New York, (Fitch); Georgia, (B.M.C. at.); Massachusetts, Harris).

Family. LIPARIDÆ, *Walker.*

Genus 1, Orgyia, *Steph.*

1. O. leucostigma, *Abbot & Smith.*—Common; end of August to October.

Distribution.—Georgia, (Abbot & Smith); Massachusetts, (Harris); New York, (Fitch); Nova Scotia, (Lt. Redman); Eastern Townships, (Gosse); Rouge District.

Family LITHOSIIDÆ, *Steph.*

Genus 1, Ctenucha, *Kirby.*

1. C. Latreillana, *Kirby.*—Numerous, flying by day, in July.

Distribution.—New Hampshire, Maine, Nova Scotia, (B.M.C. at.); Eastern Townships, (Gosse); L'Orignal and South side of the Gulf, (R. Bell); Sorel and Rouge District.

Genus 2, Lycomorpha, *Harris*; Glaucopus, *Wester.*

1. L. Pholus, *Fab.*—Abundant on flowers of *Solidago* in the day time, August.

Distribution.—New York (Emmons); Massachusetts, (Harris); Nova Scotia, (Redman).

Genus 3, Hypoprepia, *Hübner.*

1. H. fucosa, *Hübner.*—Rare, August.

Distribution.—Georgia, (E. Doubleday).

Genus 4, Crocota, *Hübner.*

1. C. brevicornis, *Walker.*—Abundant amongst ferns, and in open grassy places, on the Mountain, in July.

Distribution.—United States, (B.M.C at.); Rouge District.

Genus 5, Nudaria, *Haworth.*

1. N. mendica, *Walker.*—Common amongst Ferns, &c., on the Mountain, July.

Distribution.—Trenton's Falls, N.Y., (E. Doubleday); Nova Scotia, (Redman); Rouge District.

Family. CHELONIDÆ, *Guén.* (?)

Genus 1, Hypercompa, *Steph*; Callimorpha, *Latr.*, p.

1. H. Lecontei, *Boisd.*; Confinis and Contiqua, *Walker*; and Callimorpha militaris, *Harris*, are probably only varieties of this species.—Very numerous, on the Mountain, in July.

Distribution.—New York, (E. Doubleday); New England, (Harris); Rouge District.

Genus 2, Arctia, *Schr.*; Chelonia, *Latr.*

A. virgo, *Hübner*; Callimorpha Parthenice, *Kirby*, a variety?—Common, August.

Distribution.—New York and Nova Scotia, (B.M.C.); Massachusetts, (Harris); Eastern Townships (Gosse); Sorel.

A. Isabella, *Abbot & Smith.*—Larvæ very numerous, Autumn and Spring, May, June, and July.

Distribution.—Georgia, (B. M. C.); New York, (Emmons); Massachusetts, (Harris); Eastern Townships, (Gosse); L'Orignal, (R. Bell); Sorel.

Genus 3, Spilosoma, *Steph.*

1. S. acrea, *Drury.*—Abundant in June, Larvæ in August.

Distribution.—New York, (B. M. C.); Massachusetts, (Harris); Eastern Townships, (Gosse); Sorel.

2. S. Virginica, *Fab.*—Common, June and July.

Distribution.—Georgia, New York, and Nova Scotia, (B. M. C.); Hudson's Bay Territories, (Barnston); Massachusetts, (Harris). Eastern Townships, (Gosse); Sorel.

Genus 4, Halesidota, *Hübner*; Lophocampa, *Harris.*

1. H. tesselaris, *Abbot & Smith*, (Muff-Moth or Hickory Tussock).—Not very common, June.

Distribution.—Mexico, Venezuela, United States, (B.M.C.); Massachusetts, (Harris); Eastern Townships, (Gosse); Sorel.

2. H. caryæ, *Harris*, Annulifascia, *Walker.*—Common, larvæ very numerous, August and September.

Distribution.—Massachusetts, (Harris); New York, (Fitch); Sorel.

Family. Bombycidæ, *Dap.*

Genus 1, Clisiocampa, *Curtis.*

1. C. Americana, *Fab.*; Sylvatica, *Harris.*—The larvæ, which are extremely destructive to the foliage of the trees about Montreal in some years, are known as the "Montreal Blight." The Moth appears in July.

Distribution.—Virginia, (Abbot); New York, (Fitch).

Note.—C. Americana, *Harris*, is Phalæna Castrensis, *Abbot & Smith*, = Clisiocampa decipiens, *Walker*, (B.M.C. Lepid. Het. Part vi. p. 1448.) The latter name must stand, Americana having been applied to the foregoing species by Fabricius.

Family. Saturniidæ, *Walker.*

Genus 1, Samia, *Hübner*; Hyalophora, *Duncan.*

1. S. Cecropia, *Linn.*—Not very common; much less numerous than formerly, June and July.

Distribution.—Massachusetts, (Harris); New York, (Emmons); Niagara, Toronto, Sorel, &c.

Genus 2, Telea, *Hübner.*

1. T. Polyphemus, *Fab.*—Abundant, June and July.

Distribution.—Brazil, (B.M.C.); Massachusetts, (Harris); New York, (Emmons); Eastern Township (Gosse); Rouge District.

Genus 3, Tropœa, *Hübner.*

1. T. Luna, *Linn.*—Rare, June.

Distribution.—Mexico, (B.M.C.); Massachusetts, (Harris); New York, (Emmons); Niagara, Sorel, &c.

Group 3. NOCTUINA, *Stainton.*

Division 1. TRIFIDÆ, *Guénée.*

Sub-Division 1. BOMBYCIFORMES, *Guénée.*

Family. CYMATOPHORIDÆ, *Hen.-Schæff.*

Genus 1, Gonophora, *Bruand*; Thyatira, Ochs., &c., p.

1. G. scripta, *Gosse.*—Not very common, June and July.

Distribution.—New York, (E. Doubleday); Eastern Townships, (Gosse); Orillia, C.W., (Bush); Rouge District.

Genus 2, Thyatira, *Ochs.*

1. T. cymatophoroides, *Guén.*—Common, June and July.

Distribution.—New York, (E. Doubleday); Orilla, C.W., (Bush); Rouge District.

Genus 3, Leptina, *Guén.*

1. L. Doubledayi, *Guén.*—Rare.

Distribution.—Northern States, (E. Doubleday).

FAMILY, BOMBYCOIDÆ, *Guén.*

Genus, 1. Balsa, *Walker M.S.S.*

" Balsa, N.G. *Mas.* Corpus gracile. Proboscis distincta. Palpi graciles, recti, subpilosi, oblique ascendentes; articulus 2 us. longus; 3 us. parvus, lanceolatus. Antennæ glabræ. Abdomen subcarinatum, apice compressum, alas posticas non superans. Pedes graciles, glabri; calcaria longa. Alæ latiusculæ, apice subrectangulatæ, costa vix convexa, margine exteriore subconvexa subobliquo."

" *Male.* Body slender. Proboscis distinct. Palpi slender, straight, slightly pilose, obliquely ascending a little higher than the head: second joint long: third minute, lanceolate. Antennæ simple, smooth. Abdomen slightly keeled not extending beyond the hinder wings; tip compressed, with a small apical tuft. Legs slender, smooth; hind tibiæ with four long spurs. Wings rather broad· Forewings nearly rectangular at the tips; exterior borde slightly convex and oblique; costa very slightly convex."

1. "B. obliquifera, *Mas.* Cinerea, æneo subtincta; thorax albidus, nigro fasciatus; alæ anticæ apud costam albidæ striga obliqua guttaque exteriore trigona costalibus nigris, lineis nonnullis indistinctis deviis nigricantibus dentatis aut denticulatis albido submarginatis, punctis marginalibus nigris."

Male. Cinereous, slightly tinged with æneous. Head, thorax and forewings along the costa whitish. Thorax with a narrow black angular band. Forewings with a black streak extending obliquely from the costa to the disk, and accompanied by a black costal triangular dot; three or four irregular indistinct dentate or denticulated blackish lines which are slightly whitish bordered; a row of black marginal points. Hindwings without marks above; underside with the discal point and the exterior line slightly brownish. Length of the body 4 lines; of the wings 12 lines." Walker, M.S.S.

Montreal, not common, July.

Genus 2. ACRONYCTA, *Ochs.*

1. A. leporina, Linn. Not common.
   Distribution. St. Martins' Falls, Albany River, Hudson's Bay, (Barnston). (Eu.)
2. A. innotata, Guén.—August.
   Distribution. Trenton Falls, New York, (E. Doubleday).
3. A. fasciata, *Barnston.*—One specimen bred from a larva found eating the red cones of the sumach (*Rhus typhina*), October, 2nd 1856.
   Distribution.—St. Martin's Falls, Albany River, Hudson's Bay, (Barnston.)
4. A. psi, *Linn.*—Taken ootreacle in July.
   Distribution.—New York (E. Doubleday). (Eu.)

Subdivision 2. GENUINÆ, *Guén.*

Family, LEUCANIDÆ, *Guén.*

Genus 1. Leucania, *Ochs.*

1. L. extranea, *Guén.*—Numerous on sumach blossoms, &c., beginning of July.
   Distribution.—South America (Darwin); Venezuela, West coast of America, Georgia and Florida (B.M.C.); Orillia, C. W. (Bush); occurs also in Nepaul, Java, Australia and New Zealand, (B.M.C.) (Eu.)
2. L. diffusa, *Walker.*—Abundant, beginning of August.
   Distribution.—Nova Scotia (Redman).

3. L. insueta, *Guén.*—Abundant on treacle and sumach blossoms, in July.
   Distribution.—Florida and New York, (E. Doubleday); Nova Scotia, (Redman.)
4. L. straminea, *Weit.*—On treacle, beginning of July.
   Distribution.—New York, (E. Doubleday), (Eu.)

Genus 2. NONAGRIA, *Ochs.*

1. N? intractabilis, *Walker*, *M.S.S.*, N. Sp. "*Fœm.* Albida cinerea, gracilis; palpi porrecti, extus nigricantes; caput sat superantes, articulo 3o. longo lanceolato; pedes breves, validi, sub testacei; alæ latiusculæ, non longæ, fusco nigroque conspersæ, lunulis marginalibus fuscis; anticæ testaceo subvariæ, lineis duabus albidis undulatis, valde indistinctis, orbiculari et reniformi albido marginatis."

"*Female.* Whitish cinereous, slender. Palpi porrect, extending rather far beyond the head, blackish exteriorly; 3rd joint lanceolate, full half the length of the 2nd. Abdomen testaceous at the tip. Legs slightly testaceous, short, robust; spurs short stout. Wings rather broad, not long, minutely brown-and-black speckled; a marginal line of brown lunules. Forewings partly and indistinctly testaceous, somewhat rounded at the tips, with two very indistinct undulating whitish lines; orbicular and reniform marks whitish bordered, the former oblong the latter transverse and rather narrow. Length of the body $3\frac{1}{2}$ lines; of the wings 9 lines." Walker M.S.S.

Family, GLOTTULIDÆ, *Guén.*

Genus 1. EUDRYAS, *Boisd.*

1. E. grata, *Fab.*, Notodonta? grata *Harris.* (Animals and Plants of Massa).—Not common.
   Distribution.—New York (Emmons); Massachusetts (Harris); Sorel.

Family, APAMIDÆ, *Guén.*

Sub-Family, GORTYNIDES, *Duponch.*

Genus 1. Hydræcia, *Guén.*

1. H. nictitans, *Linn.*—Common end of July and beginning of August.
   Distribution.—New York, (Doubleday); Mass., (Sheppard); Albany River, Hudson's Bay, (G. Barnston); Nova Scotia, (Redman): (Eu.)
2. H. lorea, *Guén.*—Abundant especially on blossoms of *Asclepias cornuti* in July.
   Distribution.—New York, (E. Doubleday.)

3. H. stramentosa, *Guén.*—On treacle beginning of October (but worn).
Distribution.—New York, (E. Doubleday.)
4. H. ligata, *Walker M.S.S.* N. Sp.—Attracted by light, beginning of July.

" *Fœm.* Cinerea; palpi verticem paullo superantes; abdomen alas posticas superans; alæ linea subtus exteriore nigricante; anticæ roseo, suffusæ, fusco conspersæ et trilineatæ, lineata duplicata, 3 a flexa, orbiculari et reniformi distinctis albido marginatis, linea marginali venis que nigricantibus."

" *Female.* Cinereous. Palpi rising a little higher than the vertex; third joint lanceolate, not more than one fourth the length of the second. Abdomen extending rather beyond the hind wings. Wings slightly æneous-tinged, with an exterior blackish line beneath. Forewings mostly rose-tinged minutely brown-speckled, with three brown lines, basal line double, undulating, interior line undulating; exterior line oblique, bent in front; orbicular and reniform marks distinct, whitish-bordered, the former large and round, the latter of the usual form; marginal line and veins blackish. Length of the body 5 lines; of the wings 12 lines." Walker, M.S.S.

Genus 2. NEPHELODES, *Guén.*

1. N. signata, *Walker M.S.S.*, N. Sp.—Attracted by light, beginning of August.

" *Mas.* Rufescente cinerea, crassa; palpi caput vix superantes: antennæ subpectinatæ; abdomen alas posticas superans; tibiæ posticæ pilosissime; alæ anticæ lineis quinque undulatis nigris, litura reniformi magna alba ferrugineo varia; posticæ æneo-cinereæ, litura discali lineaque exteriore subtus nigris."

Male. Reddish cinereous, very robust. Palpi vertical, hardly rising higher than the head; 3rd joint lanceolate, minute. Antennæ slightly pectinated. Abdomen extending rather beyond the hind-wings; apical tuft rosy, large, quadrate. Legs stout; hind tibiæ very pilose; spurs moderately long. Forewings with five slight undulating black lines, and with a large white ferruginous, varied reniform mark; underside with a distinct exterior black line. Hind wings æneous-cinereous; underside with the discal mark and the exterior line black and very distinct. Length of the body 8 lines; of the wings 14 lines." Walker M.S.S.

2. N. minians, *Guén.*—On the Mountain, beginning of September.
Distribution.—New York, (Doubleday); Nova Scotia, (Redman); Orillia, C.W. (Bush.)

Sub-Family, Xylophasides, *Guén.*

Genus 3. Xylophasia, *Steph.*

1. X. lignicolora, *Guén.*—Very abundant, July and beginning of August.
Distribution.—New York, (Doubleday); Nova Scotia, (Redman).
2. X. lateritia, *Esp.*—Very abundant, July.
Distribution.—Nova Scotia, (Redman); Newfoundland, (B.M.C.) (Eu).
3. X. indocilis, *Walker.*—July.
Distribution.—New York, (Doubleday); Massachusetts, (Prof. Sheppard.)

Sub-Family, Apamides, *Guén.*

Genus 4. Crymodes, *Guén.*

1. C. gelida? *Guén.*—End of August.
Distribution.—Arctic America? (B.M.C.)

Genus 5. Mamestra, *Ochs.*

1. M. Arctica, *Boisd.*, Hadena Amica, *Steph*, (Vide Emmons, Agri., N. Y., M. plate 45, fig. 2.)—Very abundant, July.
Distribution.—New York, (Doubleday); Mass., (Sheppard); Lake Superior, (Agassiz); Nova Scotia, (Redman); Orillia, C. W., (Bush.)
2. M. brassicæ, *Linn.*—Common, June and July.
Distribution.—Orillia, C. W., (Bush; (Eu).
3. M. dubitans, *Walker.*—July and August.
Distribution.—Trenton Falls, New York, (E. Doubleday); Nova Scotia, (Lt. Redman).
4. M. ordinaria, *Walker.*—Very abundant, July and August.
Distribution.—Trenton Falls, New York, (E. Doubleday.)
5. M. unicolor, *Walker.*—July.
Distribution.—Trenton Falls, New York, (E. Doubleday); St. Martin's Falls, Albany River, Hudson's Bay, (G. Barnston); Nova Scotia, (Redman).

Genus 6. Apamea, *Ochs.*

1. A. finitima, *Guén.*—Beginning of June and July.
Distribution.—New York, (E. Doubleday).
2. A. insignata, *Walker* M.S.S., N. Sp.—Beginning of July.

"*Fœm.* Fusca; palpi oblique ascendentes; abdomen subcristatum, alas posticas superans; alæ lineis pallidis indistinctis undulatis, orbiculari et reniformi distinctis albido marginatis, hujus disco albido striga ochracea intersecto."

"*Female.* Brown, cinereous beneath. Palpi obliquely ascending; third joint conical, less than one-fourth of the length of the second, abdomen slightly crested, extending beyond the hind wings; tip tawny. Forewings with indistinct undulating pale lines, and with whitish-bordered distinct orbicular and reniform marks; orbicular mark oblique; reniform mark incomplete, bordered, its disk mostly whitish and traversed by an ochraceous streak which extends far beyond it; three whitish costal subapical points. Length of the body 8 lines; of the wings 20 lines."

3. A. glaucovaria, *Walker* M.S.S., N. Sp.

"*Mas.* Cinerea; palpi oblique ascendentes; abdomen cristatum; alæ anticæ cervino subtinctæ, glauco notatæ, lineis nigricantibus deviis undulatis, linea submarginali cuneata, lunulis marginalibus guttisque costalibus nigris; posticæ pisco late marginatæ."

"*Male.* Cinereous. Palpi obliquely ascending; third joint very short, not more than one-sixth of the length of the second. Abdomen crested. Forewings slightly tinged with fawn-colour, marked here and there with glaucous, which hue most prevalent on the large reniform mark; lines blackish, irregular, undulating; submarginal line with uniform angles; marginal lunules and costal dots black; orbicular mark large, oblique, short-oval. Hind-wings with a broad brown border; fringe whitish; underside with the discal mark and the submarginal line brownish. Length of the body 7 lines; of the wings 14 lines." *Walker M.S.S.*

3. A. modica, *Guén.*—July.
Distribution.—New York, (Doubleday).

Genus 7. Miana, *Steph.*

4. M. undulifera, *Walker.*—Rare, July.
Distribution.—St. John's Bluffs, East Florida, (Doubleday).

Genus 8. Celæna, *Steph.*

1. C ? contrahens, *Walker M.S.S.*, N. Sp.—Common, July.

"*Mas.* Pallide cinereo-cervina; abdomen albidum; alæ lunulis marginalibus fuscis; anticæ lineis tribus pallidis nigricante marginatis, 1 a 2 a que undulatis, 3 a flexa, orbiculari et reniformi pallido marginatis; postice albidæ, margine cinereo diffuso."

"*Male.* Pale cinereous fawn-colour. Palpi obliquely ascending; third joint lanceolate, less than half the length of the second.

Abdomen and underside whitish. Wings with a marginal line of brown lunules. Forewings with the basal, interior and exterior lines pale, blackish bordered; first and second undulating; third bent; orbicular and reniform marks partly pale-bordered, not distinct; costa with three pale points towards the tip; underside with a blackish discal mark and a blackish exterior line. Hindwings white, diffusedly cinereous-bordered; underside like that of the forewings. Length of the body 5 lines; of the wings 12 lines." *Walker M.S.S.*

2. C? velata, *Walker* M.S.S., N. Sp.—July.

"*Fœm.* Ferruginea; abdomen subcarinatum; alæ cupreo subtinctæ; anticæ lineis quatuor indistinctis nigricantibus, 1 a 2 a que undulatis, 3 a 4 a que denticulatis, orbiculari et reniformi parvis, hac alba; posticæ cinereæ."

"*Female.* Ferruginous, cinereous beneath. Palpi obliquely ascending rising a little higher than the vertex; third joint lanceolate, less than half the length of the second. Abdomen slightly keeled. Wings with a slight cupreous tinge. Forewings with four indistinct blackish lines; first and second lines undulating; third and fourth denticulated; marginal line very indistinct; orbicular and reniform marks small, the former cinereous and indistinct, the latter white; underside with the usual discal mark and exterior line blackish. Hindwings cinereous. Length of the body 5 lines, of the wings 12 lines." *Walker M.S.S.*

Family, NOCTUIDÆ, *Guén.*

(*Cut-worms* are larvæ of moths of this family.)

Genus 1. AGROTIS, *Ochs.*

1. A. suffusa, W. Verz.—On treacle, beginning of October.
   Distribution.—Philadelphia (E. Doubleday); Orillia, C. W., (Bush); St. Martin's Falls, Albany River, Hudson's Bay, (D. Barnston); Nova Scotia, (Redman), (Eu. and every part of the world).
2. A. spissa, *Guén.*—Common, July to September.
   Distribution.—United States, (Doubleday); Nova Scotia, (Redman.)
3. A. jaculifera, *Guén.*—Common, July and August.
   Distribution.—New York, (B.M.C.)

. A. venerabilis, *Walker.*—Common, sitting on blossoms of the Golden-rod by day in September.
   Distribution.—Nova Scotia, (Redman.)

5. A. illata, *Walker*.
   Distribution.—Unknown.
6. A. obelisca, *Wien. Verz.*—End of July.
   Distribution.—Nova Scotia, (Redman). (Eu.)

Genus 2. Graphiphora, *Ochs.*

1. G. Augur, *Fabr.*—End of July.
   Distribution.—New York, (Doubleday) ; St. Martin's Falls Albany River, Hudson's Bay, (Barnston). (Eu.)
2. G. Baja, *Wien. Verz.*—August.
   Distribution.—Rio Janeiro, (B. M. C.) ; New York, (Doubleday) ; Orillia, C.W., (Bush.) (Eu.)

Genus 3. Ochropleura, *Hübn.*

1. O. plecta, *Linn.*—Not uncommon.
   Distribution.—New York, (Doubleday) ; Nova Scotia, (Redman). (Eu.)

Family, Orthosidæ, *Guén.*

Genus 1. Xanthia, *Ochs.*

1. X. ferruginea, *Wien. Verz.*—Common, September and beginning of October.
   Distribution.—Unknown to me. (Eu.)

Genus 2. Cirrœdia, *Guén.*

1. C. pampina, *Guén.*—Not common, beginning of September.
   Distribution.—New York, (B. M. C.) ; Nova Scotia, (Redman.)

Family, Hadenidœ, *Guén.*

Genus 1. Euplexia, *Steph.*

1. E. lucipara, *Linn.*—June and July.
   Distribution.—New York, (Doubleday) ; Rouge District, (Eu.)

Genus 2. Eurois, *Hübn.*

1. E. imbrifera, *Guén.*—July.
   Distribution.—New York, (Doubleday) ; Orillia, C.W., (Bush.)

Family, Xylinidœ, *Guén.*

Genus 1. Calocampa, *Steph.*

1. C. vetusta, *Hübn.*—Taken on Treacle, beginning of October.
   Distribution.—Mass.: (Prof. Shepard) ; Orillia, C. W., (Bush.) ; St. Martin's Falls, Albany River, Hudson's Bay, (Dr. Barnston). (Eu.)

Genus 2. Cucullia, *Ochs.*

1. C. chamomillæ, *Men. Verz.*—June.
   Distribution.—New York, (E. Doubleday); St. Martin's Falls, Albany River, Hudson's Bay, (Dr. Barnston) (Eu.)
2. C. florea, *Guén.*
   Distribution.—New York, (E. Doubleday).

Sub-division 3. MINORES, *Guén.*

Family, ERASTRIDÆ, *Guén.*

Genus 1. ERASTRIA, *Ochs.*

1. E. carneola, *Guén.*—Rare, beginning of August.
   Distribution.—United States, (E. Doubleday).

Division 2.—QUADRIFIDEA, *Guén.*

Tribe, VARIEGATÆ, *Guén.*

Family, PLUSIDÆ, *Boisd.*

Genus 1. PLUSIA, *Ochs.*

1. P. ærea, *Hübn.*—July and August.
   Distribution.—New York and Florida, (Doubleday); Nova Scotia, (Redman); Orillia, C.W., (Bush).
2. P. precationis, *Guén.*—Common, August.
   Distribution.—New York and Philadelphia, (Doubleday); Mass.: (Prof. Shepard); Orillia, C.W., (Bush).
3. P. mortuorum, *Guén.*—Common, August.
   Distribution.—New York, (Doubleday); Orillia, C.W., (Bush); Sorel and Rouge District.

Tribe, INTRUSÆ, *Guén.*

Family, AMPHIPYRIDÆ, *Guén.*

Genus 1, AMPHIPYRA, *Ochs.*

1. A. pyramidoides, *Guén.*—Common in August on the Mountain.
   Distribution.—Massachusetts. (Harris).
2. A. tragogoponis, *Linn.*—Abundant, beginning of August.
   Distribution.—L Orignal on the Ottawa, (R. Bell). (Eu).

Tribe, EXTENSÆ, *Guén.*

Family, HOMOPTERIDÆ, *Guén.*

Genus 1, HOMOPTERA, *Boisd.*

1. H. lunata, *Drury.*—Taken on Treacle in May.
   Distribution.—Massachusetts, (Harris); St. Domingo, (B.M.C.)
2. H. contracta, *Walker, M.S.S.* N. Sp.—Middle of July.

" *Fœm.* Ferrugineo fusca; palpi arcuati, graciles, ascendentes; alæ lineis nigris undulatis, linea interiore duplicata strigam nigram includente, linea media dentata apud costam dilatata, linea exteriore pallido marginata; anticæ lineis duabus basalibus."

" *Female.* Ferruginous brown, cinereous beneath. Palpi curved, slender, obliquely ascending, rising higher than the head; third joint lanceoate, about half the length of the second. Wings with black undulating lines; interior line double, the intervening space partly black; middle line dentate, much dilated on the costa; exterior line pale-bordered; marginal points black. Forewings with two basal lines. Length of the body 4 lines; of the wings, 11 lines." *Walker M.S.S.*

3. H. Herminioides, *Walker, M.S.S. N. sp.*.—July.

"*Fœm.* Albido cinerea; gracilis; palpi gracillimi; alæ lineis quatuor angulosis, duabus nigris bene determinatis duabusque cinereis indistinctis, fimbria nigricante punctata; anticæ orbiculari et reniformi nigris."

Female. Whitish cinereous, slender. Palpi very slender, rising higher than the vertex; third joint lanceolate, full half the length of the second. Wings with four zigzag lines; interior and exterior lines black, much more distinct than the other two which are cinereous; fringe with blackish points. Forewings with black orbicular and reniform marks, the former small, the latter large, full. Length of the body 4 lines; of the wings 10 lines." *Walker, M.S.S.*

Tribe, LIMBATÆ, *Guén.*

Family, CATOCALIDÆ, *Boisd.*

Genus 1. Catocala, *Schr.*

1. C. amatrix *Hübn.*—Abundant in Poplar trees, beginning of October.
   Distribution.—United States (Doubleday); Nova Scotia (Redman); Orillia, C. W., (Bush); Sorel.
2. C. concumbens, *Walker.*—Not common, August.
   Distribution.—Orillia, C. W. (Bush); Sorel.
3. C. cerogama, *Guén.*—Flying from tree to tree in September, by day on the Mountain.
   Distribution.—Trenton Falls, New York, (Doubleday); Orillia, C. W., (Bush).
4. C. polygama, *Guén.*—Attracted by light in July.
   Distribution.—Orillia, C. W., (Bush); Sorel.

Tribe, SERPENTINÆ, *Guén.*

Family, EUCLIDIDÆ, *Guén.*

Genus 1. Drasteria, *Hübn.*

1. D. Erechtea, *Hübn.*—Very abundant in grass fields, July to September.
   Distribution.—New York and Illinois (Doubleday); Massa: (Harris); Nova Scotia (Redman); St. Martins' Falls, Albany River, Hudson's Bay (Dr. Barnston).

"The Hudson's Bay specimens are hardly more than half the size of those from New York" Walker, Brit. Mus. Cat. Lepid. Het. XIV, p. 1457.

Group 4. Geometrina, *Stainton.*

Family, Ourapterydæ, *Guén.*

Genus 1. Chærodes, *Guén.* Crociphora, *Harris.*

1. C. transposita, *Walker.*—End of August.
2. C. transversata, *Drury.*—Beginning of August.
   Distribution.—Massachusetts (Harris) ; Lake Superior (Agassiz).

Family, Ennomidæ, *Guén.*

Genus 1. Angerona, *Dup.*

1. A. crocataria, *Fab.*—Common beginning of July.
   Distribution.—Sorel and Rouge District.

Genus 2. Endropia, *Guén.*

1. E. effecta, *Walker, M.S.S. N. sp.*—Beginning of July.

" *Mas.* Ferruginea, cinereo varia; alæ lineis interiore et exteriore obliquis subdenticulatis obscure ferrugineis, illa costam versus flexa, linea media diffusa indistincta; anticæ subfalcatæ, margine exteriore flexo subexcavato; posticæ gutta discali nigra, margine exteriore valde inciso."

" *Male.* Ferruginous varied with pale cinereous, the latter hue most prevalent towards the base of the wings and along the costa of the forewings. Wings with the interior and exterior lines dark ferruginous, oblique, slightly denticulate; interior line bent towards the costa; middle line diffuse indistinct; underside with the middle and exterior lines very distinct. Forewings subfulcate; exterior border distinctly bent, slightly excavated. Hind wings with a black discal dot, exterior border much notched. Length of the body 9 lines; of the wings 20 lines." *Walker, M.S.S.*

2. E. refractaria, *Guén.*—August and September.
   Distribution.—Rouge District.

Genus 3. Ellopia, *Treit.*

1. E. floridaria, *Guén.*—Common in long grass, sides of the Mountain, July.
2. E. annisaria, *Walker, M.S.S. N. sp.*—Very abundant in July.

Mas. et *Fœm.* Pallide citrina; alæ subtus macula discali; linea submarginali maculari strigisque paucis fuscis; anticæ gutta discali maculisque duabus submarginalibus fuscis."

"*Male* and *Female.* Pale lemon colour. Head and forepart of the thorax brighter. Wings beneath with a few transverse brown speckles, with a brown discal spot, and a submarginal line composed of brown spots; this line very incomplete in the forewings. Forewings with a brown discal dot which is much smaller than that on the under side, and with two brown spots which indicate the submarginal line. Hind wings not marked above. Length of the body 6 lines; of the wings, 15 lines." *Walker, M.S.S.* Larva supposed to feed on the species of currant (*Ribes*). Pupa under the bark of dead stumps, &c.

Genus 4. Ennomos, *Treit.*
1. E. subsignaria, *Hübner.*—Isle Jesus, July.

Family, AMPHIDASIDÆ, *Guén.*

Genus 1. Biston, *Leach.*
1. B. ursaria, *Walker, M.S.S. N. sp.*—Common near and in the city, end of April.

"*Mas.* Obscure cinerea, crassa pilosissima, nigro conspersa; antennæ latissime pectinatæ; pedes dense fasciculati; alæ anticæ lineis quatuor obliquis nigris, 1 a flexa, 2 a, 3 a que approximatis subundulatis, 4 a diffusa; posticæ linea 1 a, obsoleta, 4 a e striga brevi lata postica."

"*Male.* Dark cinerous, speckled with black, very robust and pilose. Antennæ very broadly pectinated. Thorax with three black bands. Legs densely tufted Forewings with four black oblique lines; first line bent; second and third approximate, slightly undulating, diverging towards the costa; fourth diffuse. Hindwings with the first line obsolete; second and third apparent; fourth indicated by a short broad streak near the interior angle. Length of the body, 8-9 lines, of the wings, 22-24 lines." *Walker, M.S.S.*

Family, BOARMIDÆ, *Guén.*

Genus 1. Boarmia, *Steph.*
1. B. cunearia, *Walker.*—Woods on the Mountain, May.
Distribution.—Rouge District.

Family, GEOMETRIDÆ, *Guén.*

Genus 1. Aplodes, *Guén.*
1. A. mimosaria, *Guén.*—Not uncommon on the Mountain in May.

Family, ACIDALIDÆ, *Steph.*

Genus 1. Acidalia, *Treit.*
1. A. inductata *Guén.*—Middle of July.
2. A. similaria, *Walker, M.S.S. N. sp.*

"*Mas.* Alba; caput, thorax et abdomen basi subtestacea; alæ lineis duabus testaceis punctularibus indeterminatis: anticæ basi testaceæ."

"*Male.* White head, thorax and base of abdomen somewhat testaceous. Wings speckled with testaceous, which hue forms two incomplete and very slight lines. Forewings with the speckles more numerous than those of the hindwings; the base wholly testaceous. Length of the body, 5 lines; of the wings, 12 lines.' *Walker, M.S.S.*

3. A. anticaria, *Walker, M.S.S. N. sp.*—Common, August.

"*Mas.* Testaceo-cinerea; caput albido fasciatum, antice nigrum. Antennæ pubescentes; alæ nigro subconspersæ, puncto discali nigro, lineis tribus vix undulatis valde indistinctis, linea tenui nigricante, linea marginali nigra perangusta."

Male. Testaceous-cinereous. Head black in front; vertex with a whitish band. Antennæ whitish, pubescent. Wings very minutely black speckled, discal point black; three very indistinct hardly undulating lines which are very little darker than the ground hue; a slight blackish line between the second and third lines; marginal line black, very slender, interrupted by the veins. Length of the body 3½ lines; of the wings, 9 lines. *Walker, M.S.S.*

Genus 2. Pellonia, *Dup.*

1. P. successaria, *Walker, M.S.S. N. sp.*—Common, end of July.

"*Mas.* et *Fœm.* Pallide lutea; palpi porrecti, brevissimi, gracillimi; alæ subconspersæ, fasciis duabus margineque exteriore purpurascente roseis; anticæ acutæ, litura discali purpurascente rosea sat magna."

"*Male* and *Female.* Pale luteous. Palpi porrect, very short and slender, hardly extending beyond the head. Wings slightly speckled, with two bands and the exterior border purplish rosy. Forewings acute; the two bands more or less confluent, discal mark purplish rosy, rather large. *Male,* Antennæ minutely pubescent. Length of the body 4 lines; of the wings 11 to 12 lines." *Walker, M.S.S.*

Family, Fidonidæ, *Guén.*

Genus 1. Lozogramma, *Steph.*

1. L. subæquaria, *Walker, M.S.S. N. sp.*—Abundant in May.
   Distribution.—Sorel, St. Hilaire and Laprairie.

"*Fœm.* Albido-cinerea, ochraceo subtincta, nigricante conspersa; tibiæ postice subincrassatæ; alæ linea marginali tenui fusca, fimbria fusco interlineata; anticæ acutæ, lineis duabus obliquis albidis intus fusco marginatis.

"*Female.* Whitish cinereous, minutely blackish-speckled, slightly ochraceous tinged. Hind tibia slightly incrassated. Wings with a slender brown marginal line; fringe interlined with brown. Forewings acute, with two oblique whitish lines which are diffusedly brown-bordered on the inner side; interior line straight; exterior line very slightly undulating. Length of the body 5½ lines; of the wings, 16 lines." *Walker*, *M.S.S.*

Genus 2. Numeria, *Dup.*

1. N. inceptaria, *Walker. M.S.S. N. sp.*

"*Mas.* Cinerea, gracilis, fusco conspersa; antennæ pectinatæ; alæ linea marginali tenui nigricante; anticæ vix acute lineis duabus nigricantibus undulatis subobliquis, linea submarginali fusca diffusa indistincta, lunula discali parva nigricante."

"*Male.* Cinereous, slender, minutely brown speckled. Antennæ rather broadly pectinated. Wings with a slender blackish marginal line. Forewings hardly acute, with two slight oblique undulating blackish lines and with a diffuse and indistinct submarginal brown line; discal lunule small, blackish. Hindwings with two somewhat diffuse brown lines. Length of the body, 5 lines; of the wings, 12 lines." *Walker*, *M.S.S.*

Family, Hybernidæ, *Guén.*

Genus 1. Hybernia, *Latr.*

1. H. defoliaria, *Linn.*—Very abundant on the Mountain at the end of October, and beginning of November, on mild evenings. (Eu).

Genus 2. Anisopteryx, *Steph.*

1. A. restituens, *Walker, M.S.S. N. sp.*—Abundant in woods near Montreal at the end of October.

"*Mas.* obscure cinerea; antennæ vix pectinatæ; abdomen subflavescens; alæ cinereæ, litura, discali tenui nigricante, punctis marginalibus nigris; antica lineis duabus obscure cinereis indistinctis undulatis albido-marginatis, costa obscure cinerea."

"*Male.* Dark cinereous. Antennæ very slightly pectinated. Abdomen with a yellowish tinge. Wings cinereous with a slight blackish discal mark and with black marginal points. Forewings with two indistinct undulating dark cinereous whitish-bordered lines; costa dark cinereous. Length of the body 5 lines; of the wings, 14 lines." *Walker*, *M.S.S.*

Family, Larentidæ, *Guén.*

Genus 1. Cheimatobia, *Steph.*

1. C. boreata, *Hübn.*—Very numerous in woods at St. Hilaire and Belœil Mountain, in November. (Eu).

Genus 2. Melanippe, *Dup.*

1. M. Gothicata, *Guén.*—Common, June.
   Distribution.—Rouge District, Sorel and Southern shores of the gulf.
2. M. lacustrata, *Guén.*—Abundant, May and August.
3. M. intermediata, *Guén.*—Common, May, July and August.

Genus 3. Coremia, *Guén.*

1. C. propugnata, *Meir. Verz.*—August. (Eu).

Genus 4. Scotosia, *Steph.*

1. S. undulata, *Linn.*—Common, June and July. (Eu).
   Distribution.—Massachusetts, (Harris); Rouge District.
2. S. affirmaria, *Walker, M.S.S. N. sp.*—Abundant in August.

"*Mas.* Rufo-cinerea; thorax nigro fasciatus; alæ anticæ lineis plurimis rufescentibus subundulatis, lineis tribus distinctis dentatis nigris, linea submarginali elunulis albidis, litura discali nigra obliqua minima."

"*Male.* Cinereous. Body above and forewings much tinged with red. Thorax with a black band. Wings with a black marginal festoon. Forewings with many slight undulating reddish lines, with three distinct dentated black lines, and with a whitish submarginal line which is composed of lunules; discal mark black, oblique, very small. Hindwings pale cinereous, with several indistinct darker lines and with a reddish tinge about the interior border and the exterior border. Length of the body, 8 lines; of the wings, 18 lines." *Walker, M.S.S.*

Group 5. PYRALIDINA, *Stainton.*

Sub. group 1. Pyralides, *Guén.*

Section 1. Deltoides, *Guén.*

Family, Hypenidæ, *Guén.*

Genus 1. Hypena, *Schr.*

1. H. *N. sp.*—Abundant flying by day on the Mountain, May to July.
2. H. cæcalis, *Walker.*—May.

Genus 2. Hormissa.

1. H. effusalis, *Walker, M.S.S.*—Common in July.

"*Mas.* Cerrino-cinerea; palpi decumbentes, longissimi articulo 2o. apicem versus arcuato, 3o. lanceolato; antennæ pectinatæ; alæ anticæ lineis tribus fuscescentibus subundulatis, linea marginali fusca tenui, reniformi e striga angusta arcuata; posticæ striga latissima, lineis indistinctis."

"*Male,* Cinereous, with a slight fawn coloured tinge. Palpi decumbent, very long; 2d. joint much curved towards the tip;

3rd. lanceolate, full half the length of the second. Antennæ rather broadly pectinated. Legs smooth; spurs very long. Forewings with three slightly undulating brownish lines, the middle one somewhat bent; marginal line brown slender; reniform mark indicated by a curved slender streak. Hindwings much paler than the forewings, with the exception of a very broad streak; lines much less distinct. Length of the body $3\frac{1}{2}$ lines; of the wings 9 lines." *Walker, M.S.S.*

Family, HERMINIDÆ, *Guén.*

Genus 1. Bleptina, *Guén.* (?)

3. B. surrectalis, *Walker.*—Common in August.

Distribution.—Rouge District.

Genus 2. Herminia, *Latr.*

1. H. cruralis, *Guén.*—Abundant in grassy places, July.

2. H. concisa, *Walker, M.S.S. N. sp.*—Common, July.

"*Mas.* et *Fœm.* Cinerea; palpi arcuati, glabri, erecti articulo 3o. lanceolato; antennæ maris pubescentes; pedes simplices; alæ lineis tribus denticulatis nigricantibus, linea submarginali albida denticulata, lunulis marginalibus nigris; anticæ orbiculari et reniformi pallide flavescentibus, hac interlineata."

"*Male* and *Female.* Cinereous. Pulpi curved, smooth vertical; third joint lanceolate, more than half the length of the second. Antennæ of the male pubescent. Legs simple. Wings with three denticulated blackish lines and with one denticulated submarginal whitish line; marginal lunules black. Forewings with the orbicular and reniform marks pale yellowish and of the usual form, the latter traversed by a black line. Hindwings much paler than the forewings and with the lines less distinct. Length of the body 4 lines; of the wings 10 lines." *Walker, M.S.S.*

3. H. clitosalis, *Walker,* (H. cloniosalis, *Walker*).—Abundant amongst ferns, &c., on the Mountain in July.

Genus 3. Epizeuxis, *Hübner.*

1. E. gaosalis, *Walker.*—Abundant in grassy places, in July.

Section 2. PYRALITES, *Guén.*

Tribe, PULVURULENTÆ, *Guén.*

Family, PYRALIDÆ, *Guén.*

Genus 1. Pyralis, *Linn.*

1. P. farinalis, *Linn,* (Meal Moth).—Common in houses, June an July.

Distribution.—Massachusetts, (Harris). (Eu).

Tribe, LURIDÆ, *Guén.*

Family, ENNYCHIDÆ, *Guén.*

Genus 1. Ennychia, *Treit.* Anania, *Hübn.*

1. E. octomaculata, *Linn.*—June and July.
Distribution.—Lake Superior, (Agassiz); Rouge District. (Eu.)

Family, HYDROCAMPIDÆ, *Guén.*

Genus 1. Cataclysta, *Hübn.*

1. C. laminalis, *Walker.*—Very abundant, flying in the afternoon over flowers in gardens &c., beginning of August.

Family, BOTYDÆ, *Guén.*

Genus 1. Botys, *Latr.*

1. B. verticalis, *Linn.*—Common July.
Distribution.—Rouge District: (Eu).

The following new species of *Geometrina* taken at Sorel, probably occurs also at Montreal.

Family, MACARIDÆ, *Guén.*

Genus 1.—Macaria, *Curtis.*

1. M. spilosaria, *Walker, M.S.S.*—In firwoods, May.

"*Fœm.* Fusca; palpi brevissimi; thorax nigro fasciatus; abdominis segmenta albido marginata: pedes nigricantes, tarsis albido fasciatis; alæ anticæ cinereæ, extus fuscascentes, fasciis duabus fuscis, subundulatus nigro marginatis, linea exteriore nigra denticulata subundulata, linea submarginali, e lunulis albis, linea marginali e punctis elongatis nigris."

"*Female.* Brown. Palpi very short. Thorax with a black band in front. Abdomen with the hind borders of the segments whitish. Legs blackish; tarsi with whitish bands. Forewings cinereous, with the exterior part brownish; two brown slightly undulating black-bordered bands; first band basal; second interior; a denticulated slightly undulating exterior black line, followed by an incomplete line of white lunules; marginal line composed of elongated black points. Hind wings cinereous, with the lines very slightly marked. Length of the body 5 lines; of the wings 14 lines." *Walker, M.S.S.*

June 4th, 1860. Exeter, Devonshire.

ARTICLE XXXVIII.—*Abridged Sketch of the life of Mr. David Douglas, Botanist, with a few details of his travels and discoveries.*

(Continued from last Number.)

On his arrival in London late in autumn, his welcome among his friends was of the warmest and most gratifying description. The exhibition of his discoveries at the meetings of the Horticultural Society, and the notices of his new contributions in the various branches of Natural History, in the respective scientific periodicals, raised his name, and soothed his feelings on the steep and thorny ascent to high reputation. In time these flattering sensations, as is usual with ardent dispositions, lost their glow, and he felt that he could not rest on his laurels; the only benefit reaped from them was an extensive acquaintance and the thorough conviction in his own mind that his field of duty lay not at home, but amongst the unexplored riches of the soil, in foreign lands. His most attached and valuable friends were of the same opinion. Amongst these might be reckoned Capt., afterwards Col. Sabine, who kindly took Douglas under his own particular instructions and patronage, so that the latter was soon taught the use of astronomical instruments and became a most accurate observer.

Looking forward with sanguine expectation to a brilliant course now opening up before him, the comforts of home and pleasures of london society were abandoned, and Douglas again embarked for the Columbia, refreshed and strengthened for a still brighter career. During the interval he had benefited greatly by the society of his inestimable friend Hooker, and both Mr. Sabine and his brother Capt. Sabine had shewn him special marks of regard. At the suggestion of the latter the Colonial Office supplied him with an excellent set of instruments of various descriptions, so that the result of his investigations might be rendered important and useful, and his time be profitably occupied. His endowments of disposition and mind fully enabled him to make the most of these advantages and to bring into play the knowledge he had acquired, as opportunities might offer themselves to him. After an eight month's voyage he again set foot on the shores of the Columbia, where he had many a warm greeting. We were glad to see again amongst us an old friend, with his noble countenance, and agreeable hearty manner unchanged, and pleased to find that his stature as a disciple of science had greatly increased.

From the 3rd of June 1830, the date of his arrival, until the period of the leaving of the loaded boats for the interior, his time was occupied in unpacking his boxes, in the adjustment and trial of his instruments, and the determination of the position of Fort Vancouver, but during his leisure hours we had the enjoyment of his enlivening society.

Lewis and Clarke's Fork being a place of some note as the point of confluence of the two great branches of the Columbia, the North and the South, Mr. D. desired to adopt it as one of his principal stations for astronomical and magnetical observations. I therefore had the pleasure of his company up to Wallawalla, to the charge of which post I had been appointed. On the route, whenever an opportunity offered we were on shore together, and I was much surprised to remark the quickness of sight he displayed in the discovery of any small object or plant on the ground over which we passed. When in the boats, as they proceeded along, he would frequently spring up abruptly in an excited manner, and with extended arms keep his finger pointed at a particular spot on the beach or the shelving and precipitous rocks, where some new or desirable plant had attracted his notice. This was the signal to put on shore, and we would then be amused with the agility of his leap to the land, and the scramble like that of a cat upon the rocks to the object he wished to obtain, happy if he achieved this without slipping, and falling into the deep water alongside the boat.

The boats being got rid of at Wallawalla he was immediately busied in taking observations, and in that portion of the Columbia, there being scarcely ever a cloud or speck upon the sky his astronomical work advanced surely and rapidly. The regularity of barometrical and magnetical figurings was conspicuous, and the diurnal variations of temperature remarkably equal, the humidity of the atmosphere generally a mere trifle. The apparatus employed was of the most select kind of that day. Even the famous Arago had furnished approved asbestus thread for suspending the magnetic bars, and the zealous and persevering observer applied to every operation the utmost of his care and skill. To enable him again to visit the Blue Mountains, the heights of which range he wished to ascertain and the distribution of plants at various altitudes along its slopes, I furnished him with five horses, and our interpreter with a sturdy boy. After a few days absence on this excursion he returned, having accomplished all that he had expected, yet regretting that the wild disposition of the Shoshonees, and our slender acquaintance with them, prevented his penetrating further to the southward within their bounds. To have attempted that would have been attended with great risk and danger. At this time we adopted a very successful mode of catching lizards; Indian boys were employed to beat about for the game armed with single horse-hair lassos, tied to the end of a wand. It was laughable to see the little urchins, naked as they were born, scouring about, and when they discovered a hole, throwing themselves flat on the heated sand, and extending the small noose over the entry to the reptile's apartment. Where their victim shewed his head, they would then quickly suspend him with one jerk, and bring him like a culprit to our sides: a slight reward would put them in ecstasies, and they would again scamper off for renewed captures. The most common species obtained was an *Agama*, the *Tapaya Douglasii*, and a very beautiful long tailed little lizard of a light pavonine iridescent hue. It measured about six inches or more, was particularly agile and appeared to great advantage, as it flitted rapidly before the sun from knoll to knoll. It was probably a *Cnemidophorus*. The habitations of all creatures of this class can be quickly found in the sand of that arid region, collected often in heaps around the interlacing roots of *Purshia tridentata* and a few *Artemisias*, and stinted grasses growing there.

On the 23rd July Mr. Douglas left Wallawalla and I felt his absence as a sad blank, only to be recompensed by a future meeting, a hope which however was never to be realized in this life. His thoughts were turned towards California, and he availed himself of the occasion of a return boat to Fort Vancouver to return to the coast. It was this year, in the beginning of August, that fever and ague first shewed itself on the Lower Columbia. Its ravages among the natives were fearful. Ignorant of the complaint, and accustomed to daily bathing, when the hot stage arrived, they would plunge themselves into the cold waters of the river and drag themselves out again merely to breathe their last upon the sand. The beeches in front of the crowded villages were strewed with dead. The aged and the young and mothers with their babes remained in the huts to perish; only the more robust flying to the mountains arrested the progress of the malady, and prevented it from entirely extirpating the river tribes; small pox could not have made a more destructive sweep. It remains a question for physicians to solve, how this intermittent, until then quiescent in that quarter, should have at once broken out with such violence without any apparent reason. The banks of the river were unchanged, with the exception of about 100 acres of land, which had been only gradually brought into cultivation at the farm of Fort Vancouver. What possible effect could this cultivation have had on points thirty and fifty miles distant, where the complaint was equally prevalent? The disease has taken permanent root in that district of country. All at the establishment were sufferers by the unwelcome visitation, and Douglas was ill like others, but being something of a leech, had an early recovery, and recruited perfectly by following up his wonted healthful perambulations. He this season had added nearly one hundred new species of plants to his former discoveries.

I have a letter from him dated Fort Vancouver, August 4th, part of which I shall transcribe, as it partakes much of his lively style.

"Ere sundown on the day I left you, we encamped on the small gravelly island three-fourths of a mile below Day's River. The latitude of that stream, that is its junction with the Columbia, from two meridional observations of stars, and one observation of the polar star near the meridian, gave me 45°, 43′, 12″ N.

"Tuesday evening took us to the Cascades, the land of my little vain Indian Chumtalia. It was *Hyass* * Sunday with him. The whole earth from the east and from the west, from the most distant parts, had congregated to make mirth with him, and to *Patchatch* † on the never-to-be-forgotten occasion of the perforating the septum of his young daughter's nose, and piercing her ears. It would have been very ungallant to the young lady, as well as ungracious towards the father, to have pressed him or any of his band, to go with me to the mountain at such a time. I therefore deprived myself of that pleasure and proceeded to Fort Vancouver, where I arrived on Wednesday at kail time. Chumtalia in six days more, comes for me in his large canoe. You may look upon 121° 07′ 07″ W., as a very close approximation to truth, for the longitude of the upper throat of the dalles. Latitude 45° 37′, 47″, as ascending with you, verified to my entire satisfaction on my return. The centre of the portage of the Cascades, latitude 45°, 39′, 30″, the mean of several observations. Longitude 121°, 58′, 00″.

* Hyass, great. † Patchatch, supposed to mean feast.

"I have arranged my barometer every way to please me, but I wish you had been with me to have lent me a hand, for I had some trouble boiling the mercury in the tube. Fortunately I can find only ·004 of an inch of index error, from the comparison I made with it and my others at Greenwich. I could have done no more, had I been in Dolland's shop. I shall give you the altitude of the mountains in my next, which I hope will be numerous, on the Willamette Ridge."

In fulfillment of this promise he wrote me again on the 29th November from Fort George (Astoria).

"By Mr. Ogden I was favored with your kind letter, relating to the crop on the Wallawalla River, together with other good things it contained. I hold myself greatly in your debt, and sincerely thank you for the same. I had an extensive journey in the Willamette with Mr. McLeod, and benefited myself, besides being greatly gratified by it. The valley is by no means of that extent generally ascribed to it; where we apply the test of measurement it indeed falls far short. The basin of the Multnamah, that is the country bounded on the east by the woody ridge of mountains that skirt the coast and generally keep parallel to it, and that ridge of the cascades which forms the platform of Mount Hood, (and of the culminant points of land to the south, which preserve a nearly south-west direction until they dip into the sea,) the termination of which is Cape Orford, is from the Columbia Valley to the most remote high lands that divide it from the Umptqua, only 127 miles, the breadth being about 70 from east to west, forming nearly a triangle. The soil is not so well calculative for tillage as represented. It is parched in summer, and its herbage destroyed by crickets. In winter it is deluged by rain, all its depressed parts, called plains, being covered with water. The highest land on which I was on that Willamette Ridge is 1043 feet elevated above the apparent base. This is barometrical but observe I should not adopt it, *only as a very close approximation* to its real height, for want of simultaneous observation at the base, when at the peak myself. I was obliged to take the mean of a series of observations before starting, and after my return, as true for the lower station. With all these disadvantages, I am truly gratified to state to you that my geometrical measurement was 1013 feet. All and more than ordinary care was taken as to the base line; and to do away with errors of eccentricity of the instrument and the like, generally found in the most perfect sextants, I employed a reflecting circle. As I used it, all errors of the kind were insensible. By the same operation, I find 11,320 feet for Mount Jefferson. The day however was not so good as I could have wished, the snow capped summit was obscurely defined by reason of flaky and stray milky, clouds, that adhered to it with great obstinacy. This does not affect greatly the general result. I would have had much reason to rejoice, had I not had a misfortune on my return. On one of the rapid tributaries of the Mattnomah, I lost all my zoological collections, a dreadful loss, as it contained good things. It is curious; on the 17th November 1826, *I lost everything I had at the same place*, when returning from my southern journey! A *kelpie*, or elf is the charm of that stream,* so unfortunate to me. Since that time I have made my intended trip to the cascades with my friend Chumtalia. I accomplished all I wished. Poor Chumtalia is since dead. He was blown up by his powder horn which was on his person, and falling on his side, his knife entered about the fifth rib so that he died. He is now laid with his fathers. Your friends will have told you of the ravages a fatal intermittent fever has made among the red men in the lower parts of the river. I was ten days in that state, between hope and fear, but never was laid down. I am now thus far on my way to California. It will depend entirely on the country, and the facilities I meet with from the men in power there, whether my stay will be long or short; I shall feel gratified by being remembered by you, thought of and written to, if you can make it convenient."

He reached Montery at the winter solstice, the season when vegetation there again recovers from the autumn drought. The roots that have been parched by the summer's heat, again have imbibed humidity and send up their juices, and seeds that have been preserved sound by the dryness of the atmosphere, now swell under the rains, and shoot up with a rapidity unknown in northern climates. The beautiful *Ribes speciosum* there adorns the bush, and the *Nemophila insignis* with its delicate blue carpets the sandy lawn. Douglas now botanized among the ranges along the coast to the southward as far as Ste. Barbara, and then returning leisurely reached San Francisco in June. Thence he continued his route as far north as latitude 38° 45′, hoping to reach the spot where in October 1826, he had visited the great pine trees

* River Sandiam.

beyond the Umptqua, but in this he was disappointed. To have made the attempt with any degree of safety would have required the company of a greater party than he had the means of commanding. Thus he was constrained unwillingly to return.

So little intercourse was there in those days with San Francisco that he was detained all winter and spring there without finding an opportunity of shipping himself off, but his time was comfortably spent at the præsidias, where the hospitality of the *padres* was extended to him in so kind a manner that he ever warmly remembered it. The collections he made during all this long period were worthy of his high reputation. Above 400 species of the mass of plants which he sent to England were yet undescribed. Of these some were superbly flowering kinds, forming new genera, giving to botanists an enlarged idea of the productive vegetating powers of the soil and climate of Upper California. In August of 1832 a passage was at last obtained to the Sandwich Islands, where he was attacked by rheumatic fever, the consequence of too much exposure to the vicissitudes of the weather. Upon recovery he left for the Columbia, which he entered towards the end of October.

In March of 1833, he made a short tour by the Cowlidsk river to Puget Sound, where he took a rapid survey of the bays and headlands, determining their latitude and longitude, and obtaining the altitudes, bearings and distances of the snowy peaks that rear themselves up from the pine clad mountains, which swell out in increasingly formidable proportions as they retire from the sea. A number of mosses and algæ were collected in this quarter, classes which hitherto he had had but small opportunity of noticing. Immediately on his return from the Sound he favoured me with a letter of some length, which it may not be uninteresting here to insert, as it gives a description of California in some points as it then stood:

"Fort Vancouver, March 17th, 1833.

"Last August at the Sandwich Islands I had the pleasure to receive a letter from you, and in October on my arrival here a second, accompanied by a beautiful sample of cyanite, and fine specimens of my *Pæonia* from the Blue Mountains of Wallawalla. I am exceedingly obliged by this, and request to lay before you my best thanks for this mark of your goodness. Such allow me to say was bestowed where it is felt, and will be remembered. An hour or two's conversation with you to renew the pleasant moments we passed in 1830, would at this time and distance of place, afford me the utmost gratification, the more especially to one so ill qualified for writing as I am. Indeed writing is out of my line of life. I spent 19 months in California and amassed a collection, of such an extent, as can only be equalled by its novelty and beauty. California is a most beautiful and highly diversified country. Snowy mountains, low hills clothed with wood, extensive plains, undulating grounds, in fact all except the Great River, which certainly sometimes makes but a cold feature in American scenery. The climate, though warm is healthy, and were it not for the intense drought of July and August, the soil would be very productive. In no part of the world have I experienced such a dryness in the atmosphere, nor can I call to my memory having read of greater. Even the deserts of Arabia and Egypt, the plains of Sin and Ispahan in Persia, I mean the driest places on the globe, when satisfactory observations have been made, are more humid than California. Often when the thermometer Fahr., stands at 80° or 100°, 30° or 40° of dryness is by no means unfrequent. On some occasions I have sunk the thermometer below *zero*, and after repeated trials, with all the care I am capable of bestowing on such a delicate operation, not the least particle of moisture could be detected. But nature ever kind and varied in her operations, compensates for this extreme dryness of the daytime by copious dews during the night, at all times proportionate to the dryness of the preceding day. Otherwise animals or vegetables could not live; the most would only be existence, and that for but a short period. In 1831, the rain was only ·700 of an inch, the 39th part of the mean of the English climate. Notwithstanding these great drawbacks to this beautiful country, it is the land of the vine, the olive, the fig, the banana, and in the southern parts, of the sugar cane, and a variety of the usual fruits seen in semi-tropical climates. The vine is cultivated to a large extent, from 10,000 to 100,000 in one vineyard. The wine is excellent, indeed, that word is too small for it; it is very excellent. I lived almost exclusively with the fathers who without an exception, afforded me the most essential assistance, hospitality to excess, with a thousand little courtesies which we feel and cannot express. I had no bickerings about superstition, no attempts at conversion or the like, the usual complaints of travellers, indeed so much to the contrary, that on no occasion was an uncharitable word directed to me. When there I was under no restraint; my time was entirely my own, feast day and fast all the same, the good men of God gave me always a good bed, and plenty to eat and drink of the best of the land. A more upright and highly honorable class of men I never knew. They are well educated; I had no difficulty from the beginning with them, for saving one or two exceptions, they all talk Latin fluently, and though there be a great difference in the pronunciation between one from Auld Reekie, and Madrid, yet it gave us but little trouble. They know and love the sciences too well to think it curious to see one go so far in quest of grass."

"The Mexican territorial government as applied to California is abominable, and that is the mildest word I can use. The secular part of the community is sot so, some good and many bad. The ladies are handsome, of a dark olive brunette, with good teeth, and the dark fine eyes, which bespeaks the descendant of Castille, Catalan or Leon. They (sweet creatures) have a greater recommendation than personal attractions. They are very amiable. On this head I must say, *Finis*, otherwise you will be apt to think, if ever I had a kind feeling for man's better half, I left it in (Calida Fornax,) California."

"What a fine country for geology, finer than for botany. Perhaps I may at a future time discuss this matter, as well as give a treatise on the geographical distribution of plants indigenous to North America generally. This will occupy a considerable time, if ever I complete it; at all events much material in many departments is now in my possession as a ground work. But, great as is certainly this field for the naturalist, the Sandwich Islands, are, from their position on the earth's surface, their origin, and their great altitudes, still more interesting; and this interest is not diminished, from their having been the theatre of the tragic death of the illustrious Cook, and by the now well known good disposition of the natives.

"You may be aware that on Owyhee, on the lateral banks of Mouna Roa, or the Big, there is the largest volcano in the world, the mouth of which is nine miles in diameter, at this moment throwing out rivers of liquid fire. I cannot attempt to describe the sensations felt, the even fearful excitement experienced during my visit to this place. We have the trees of the world, the orange, lemon, coffee, banana, and tropical *tree ferns*, which characterize the features of warm countries, about the level of the sea, farther up, those of more temperate climes, until we arrive at similar verdure to that found on the Scottish Alps, and lastly we reach the region of snow and ice, where nature forever denies to the wearied visitant the refreshing relief to the fatigued eye, of a blade of grass or even a moss. But to behold even verdure clinging to the craggy land perpetually bathed in vapours, composed of hydrosulphurous gas and other combinations, which to all other kind of vegetables would be utter, nay almost instant annihilation is a fact that claims attention. Thus, we behold apparent discordance in the great operations of nature, which manifest an infinite intelligence and power in the Almighty hand; in each being the life of the Eternal; in each climate, His unity; in every distant planet His ubiquity; in every provision the fulness of His mercy; and in the constancy of their action, His truth. The geological world knows nothing yet of the origin of volcanic forces, but we do know that they are the irregular secondary results of great masses of matter, obeying the primary laws of atomic action, that they differ in their intensity, are interrupted in their periods, and are aggravated, or restrained by an endless number of causes, external and purely mechanical. Of all modes of material combinations, this is perhaps the most complicated. To assume then that volcanic forces have not only been called into action at all times in the natural history of the earth, but also, that in each period they have acted with equal intensity, seems to be merely a gratuitous hypothesis, not formed on any of the great analogies of nature, and I believe unsupported by the direct evidence of fact. This theory confounds the immutable and primary laws of matter with the mutable results arising from their irregular combination. It assumes that in the laboratory of nature no elements have ever been brought together, which we ourselves have not seen combined; that no forces have been developed by their combinations, of which we have not witnessed the effects. And what is this but to limit the riches of nature by the poverty of our own knowledge, and to surrender ourselves to a mischievous but common scepticism, which forces us to deny the reality of what we have not seen, and even to doubt the truth of what we do not perfectly comprehend? In no place on the globe can the geologist better devote his time to reconcile and render harmonious this obscure but beautiful part of this exalted science, than at these islands. All that my feeble capacity can do is but a bubble.

"To console myself for the want of friends of a kindred feeling in this distant land, for an exchange of sympathy or advice, I vary my amusements; by day it is a barren place that does not afford me a blade of grass; a bird, or a rock, before unnoticed, from which I derive inexpressible delight, while during the stillness of a cloudless night their localities are determined, altitudes measured, the climate they breathe analyzed. Thank God my heart feels gladness in these operations; without such to pass away an hour, my time would be blank. I willingly admit however, there is one way, and one only way in which a man's powers may be cramped by the pursuit of natural truth, and that is by too ardent devotion to it. In the pursuit of any subject, however lofty, a man may become narrow minded, and in a condition little better than moral servitude, but by embracing different subjects, we need not fear on this head. Every department of science offers its spoils for our decoration. We can be carried into regions where we contemplate the most glorious workmanship of nature, and where the dullest imagination becomes excited. We can travel through distant lands and become acquainted with the complexions and the feelings and the characters of mankind, under every form of life; and in doing this, if we be not most indocile pupils we must learn many lessons of kindness, and freedom of thought along with appropriate knowledge of our immediate vocation."

"I shall have left the Columbia before you receive this hasty note, which I regret the more, as I shall not have the pleasure of hearing from you; however though far apart you are with me in recollection. Whether I return through the Russian Empire, or the islands of the south seas, I have not yet determined. My arrival in England is uncertain. May you enjoy all and every happiness this world affords, and may God direct your steps."

The Frazer's River County had not yet been seen by the indefatigable traveller. He therefore took a passage in the boats that were leaving Fort Vancouver on the 20th March, with the party preceeding across the Rocky Mountains, and quitted them at Okanagan in about latitude 48° 5′ 0″, striking north on horseback as far as Kamloops Fort on Thompson's River. Thence by adopting the same means of conveyance and keeping a northerly course he reached Alexandria on Frazer's River, in latitude nearly 52° 25′ 0, longitude 122° 30′. Embarking now on this river he con inued up stream, taking the western Fork as far as Stuart's Lake say latitude 54° 30′ N., longitude 124° 10′ W. Upon his return from this lake, he met with another of those unfortunate accidents, that cannot always be avoided in small canoes, and which had already so often occurred to him on the waters of the Columbia and its tributaries. He was wrecked in a dangerous part of the river, and again lost all the fruits of the toil of the present journey and the plants he had collected on the way. His relation of this disaster, which occurred on the 13th June 1833, is conveyed in a letter to his friend Sir W. J. Hooker."

"On that morning at the stony islands of Fraser's River, my canoe was dashed to atoms, when I lost every article in my possession, saving an astronomical journal, book of rough notes, charts, and barometrical observations, with my instruments. My botanical notes are gone, and what give me most concern, my journal of occurrences also, as this is what can never be replaced, even by myself. All the articles needful for pursuing my journey were destroyed, so that my voyage for this season was frustrated. I cannot detail to you the labor and anxiety this occasioned me both in body and mind, to say nothing of the hardships and sufferings I endured. Still I reflect with pleasure that no lives were sacrificed. I passed over the cataract and gained the shore in a whirlpool below, not however by swimming, for I was rendered helpless and the waves washed me on the rocks. The collection of plants consisted of about four hundred species, two hundred and fifty of these were mosses, and a few of them new. This disastrous occurrence has much broken my health and spirits. The country over which I passed was all mountainous, but most so towards the western ocean. Still it will ere long be inhabited."

To this last remark of the gifted Douglas we may safely attach the epithet prophetic. No one but a person of the highest intelligence and foresight would at that time have made it. The country was accessible only by the circuitous routes followed by the fur traders through hilly mountainous districts, and was roamed over solely by wild Indian tribes. Now it is traversed in every direction by those of the white race who search for gold, and who will establish themselves, whereever the yellow dust may be found, or whereever the soil and climate may render the cultivation of the earth, or a pastoral life, agreeable."

ART. XXXIX.—*On the Track of an Animal lately found in the Potsdam Formation.* By Sir W. E. LOGAN, F.R.S.

(*Read before the Natural History Society of Montreal, June,* 1860.)

The Potsdam sandstone is recognised in Canada and New York as the base of the Lower Silurian series. As far as we are certain of the formation in the province it rests unconformably upon the Laurentian series; but on the north shore of Lake Huron, the Huronian series supports unconformably a sandstone which has been supposed to be Potsdam; as no fossils, however, have been met with in it there, its equivalence is somewhat doubtful, particularly as the superior fossiliferous rock into which it passes, appears to be of the Bird's-eye and Black River group.

Mr. Barrande in a paper communicated to the Geological Society of France about a year ago, compares the Potsdam formation with the Primordial Zone, and appears disposed to unite it with the strata marked by *Paradoxides* near Boston in Massachusets, and Placentia Bay in Newfoundland, the first locality yielding *Paradoxides Harlani* which he identifies with his *P. spinosus*, and the latter Mr. Salter's *P. Bennetii*, and probably other allied genera and species. But while no well ascertained Primordial species have been met with in the Potsdam of Canada and New York, the formation appears in Canada to be rather allied to the strata above than those below it.*

In the Potsdam of Canada and New York, independent of fucoids, the number of species of which the forms have been either wholly or partially preserved is only three. Two of them are *Lingulæ*, named by Hall *L. prima*, and *L. antiqua*; and while these so far resemble one another that they might by some palæontologists be considered varieties of one species, we in Canada have a *Lingula* (*L. Belli* of Billings,) in the Chazy, which might almost be considered another variety of the same species, the peculiarity of them all being the length and sharpness of the beak. In Canada there is also found in the Potsdam, the impression of the spire of a large flat *Pleurotomaria*, which so strongly resembles the spire of *P. Laurentiana* (Billings) of the Calciferous, that they can scarcely

* Since this paper was read, it has been ascertained by Mr. Billings, that the trilobites found in the Potsdam at Keesville, New York, and presented by Mr. Dana at the meeting of the American Association at Montreal in 1857, belong to *Conocephalus*, one of the genera characterizing the Primordial Zone in Bohemia.

be distinguished. In addition to these upward affinities in the only preserved forms, there are beds of passage between the Potsdam and Calciferous formations, in which the strongly marked distinctive lithological characters of the two are well preserved, and at St. Timothy on the Beauharnois Canal those beds of the inter-stratification which are allied to the lower rock are occasionally marked by *Scolithus linearis* (Hall), supposed to be ancient worm-holes, by which the Potsdam is characterised in many parts.

Immediately beneath these beds of passage are the celebrated foot prints of Beauharnois, to which Professor Owen has given the name of *Protichnites.* Since these were described by Owen, nothing has been discovered to throw farther light upon the forms of the animals which made these impressions; but in thinning a large specimen with some of the tracks on it, for the purpose of placing it in the museum of the Geological Survey, it was ascertained that the surface on which the traces were impressed must have been subject to the ebb and flow of a tide. The surface on which the tracks are impressed and the one immediately beneath, shew ripple-mark; the next in succession which is about an eighth of an inch below, shews wind-mark, in a number of sharp and straight parallel ridges from two to four inches long and an eighth or a quarter of an inch wide. These characterize a considerable surface, and are precisely similar to the marks so familiar to every person who has examined blown sand. The surface must thus have been alternately wet and dry, and the organic remains of the formation being marine, we have thus pretty clear evidence of a tide.

Proverbially unstable as water is, the mean level of the sea, that is the point which is half-way between high and low water, is supposed to be the least changeable level on the face of the globe, and taking it to be now pretty much as it was during the Lower Silurian period, we establish the means of knowing approximately how much the position where the tracks are found, is higher than it was when these were impressed, the limit of error being the number of feet which would represent the difference between the ebb and flow of the sea in the locality, or perhaps not more than fifty feet. We have thus a bench-mark to test the rise not only of these strata at Beauharnois, but of their equivalents, wherever else they may be met with.

Finding that this ancient sand bank was exposed at the ebb of tide we naturally look out for some coast to which it was related.

The Potsdam sandstone terminates some twenty miles to the north at a very low angle against the foot of the Laurentide hills, which rapidly rise up 500 or 600 feet above the Silurian plain. There is little doubt that we have in the flank of those hills the ancient limit of the Lower Silurian sea, the shore of which is thus traceable from Labrador by the north-west, to the Arctic Ocean, a distance of 3,000 miles. But though we have thus evidence of a Lower Silurian dry land and can scarcely suppose that it was wholly destitute of vegetation, we have not yet discovered any certain drifted vestige of its plants along many hundred miles of its coast.

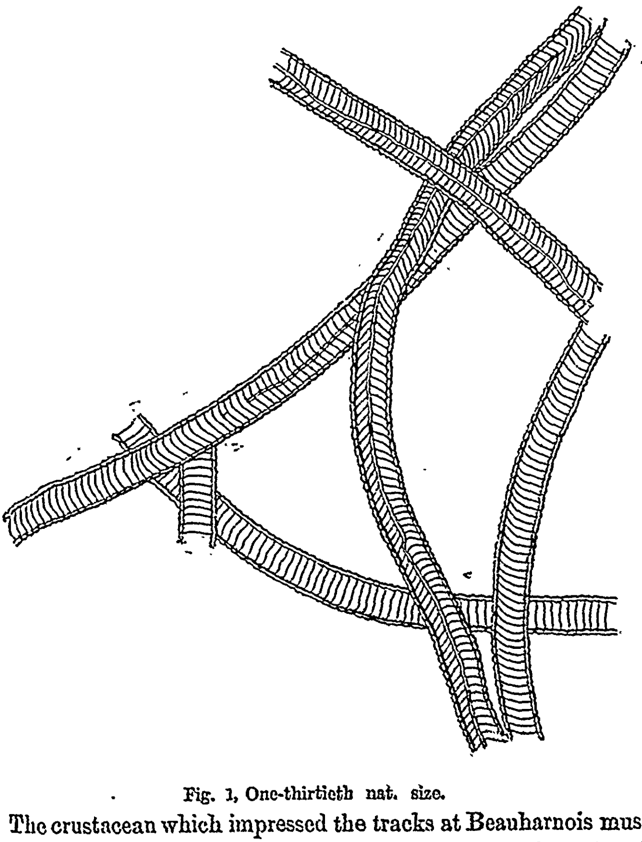


Fig. 1, One-thirtieth nat. size.

The crustacean which impressed the tracks at Beauharnois must have been a litoral animal, tracks of which have now been found in several places nearer than Beauharnois to the marginal limit of the sea to which it belonged. These localities are St. Ann, Vaudreuil, Presqu'ile, Lachute, and St. Elizabeth, and they were last year observed in the neighbourhood of Perth. In the last locality they are associated with a new and remarkable description of track for the discovery of which we are indebted to my friend Dr. James Wilson of Perth, who sent me specimens of it in the month of November last.

The largest of the specimens was between two and three feet long by a foot wide, and the track upon it so singular that I became desirous of obtaining a greater extent of the trail. For this purpose, in the beginning of Deccember, I sent Mr. Richardson to Perth, where he was guided to the quarry by Dr. Wilson, and shewn the bed in which the tracks occur. The quarry, of which the strata are nearly horizontal, is about a mile from the town, and with the aid of Mr. Glyn, the proprietor, Mr. Richardson obtained in fragments, a surface which measures about seventy-six square feet. To obtain this required a good deal of patience, for there was half a foot of snow on the ground, and from under this it was necessary to remove between two and three feet of rock in order to reach the bed The rock is a fine grained white sandstone similar to that in which the *Protichnites* occurs at Beauharnois, and of that pure silicious character which is so well known to belong to the Potsdam formation wherever it is met with. The tracks are impressed on a bed which varies in thickness in different parts from one eighth of an inch to three inches. When the upper bed was removed large portions of the track-bearing bed came away with it, and it was necessary to separate the layers. This was done by heating the surface with burning wood placed upon it, and then suddenly cooling it by the application of snow. This of course cracked and destroyed the thin bed with the impressed tracks, but it left the mould of them on the underside of the upper bed, and by plaster casts from this we have obtained the true form of the original racks.

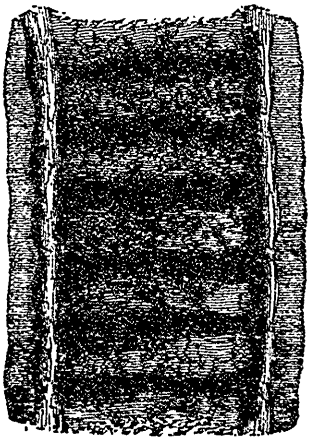


Fig. 2, One-fifth nat. size.

These tracks consist of a number of parallel ridges and furrows something like ripple marks, which are arranged between two narrow continuous parallel ridges, giving to the whole impression a form very like that of a ladder, and as the whole form is usually gently sinuous it looks like a ladder of rope. The surface obtained shews six different trails, (Fig. 1,) the longest of which is about thirteen feet, but they are all of the same breadth, and they may all have been impressed by one and the same animal. The breadth of the trails is about six inches and three-quarters to the outer sides of them.

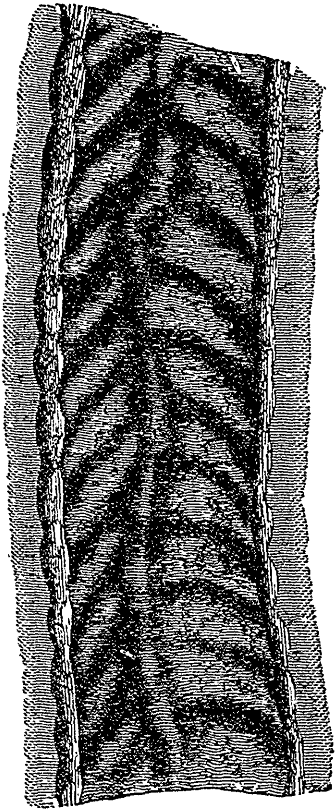


Fig. 3, One-fifth nat. size.

The transverse ridges and furrows are sometimes straight (Fig. 2,) and sometimes curved (Figs. 3-4-5.) When straight and regular they measure about an inch and three-quarters from the middle of one furrow to that of the next. The height of the ridge is usually from one and a half to two lines, and from the highest part the distance to the middle of the furrows is about an inch and a quarter on one side and half an inch on the other, thus giving to the ridge a sharper slope on the shorter side. The tops of the ridges, and the bottoms of the furrows are somewhat rounded.

Though the transverse ridges are occasionally straight (Fig. 2) they are in general either slightly or considerably curved (Figs. 3-4-5), and when so, the chord of the curve is seldom quite at right angles to the direction of the parallel side ridges, one end of the chord in the greatest obliquity observed being as much as two inches and a half in advance of the other (Fig. 3). The height of the curve above the chord is sometimes as much as an inch and three quarters. It is often somewhat pointed, and the highest part is not always in the middle between the parallel side ridges (Fig. 4). The concave side of the curve is always on the steeper side of the tranverse ridges.

There runs along the track a ridge intermediate between the two parallel side ridges, (Figs. 3-4-5), and though it is not so conspicuous as these, it is seldom altogether wanting, but appears to be, most obscure when the transverse ridges, or rounds of the ladder, are straight. This intermediate ridge does not keep parallel with the side ridges, but occasionally runs in sinuous sweeps from within an inch and a half of one side (Fig. 5) to the same distance from the other; sometimes however, it runs nearly parallel with the sides for a considerable distance, either in the middle or somewhat on either side of it. In one of the tracks there is in the course of the intermediate ridge a sudden dislocation of an inch and a quarter (Fig. 3 towards the top,) on the opposite sides of one of the transverse ridges.

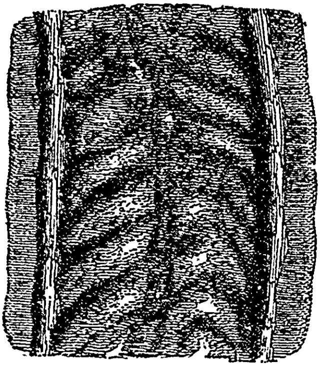


Fig. 4, One-fifth nat. size.

The course of the intermediate ridge appears in general to coincide with the successive most salient parts of the transverse ridges when these are curved, but this is not always the case (Fig. 4). The intermediate ridge appears most conspicuous where it crosses the transverse furrows, yet its crest or line of summit seems to undulate with the ridges and furrows, though not to so great a degree.

The inner flanks of the side ridges appear to be continuously even surfaces, making an angle of 155° with the plane of the intermediate spaces, and against these sloping flanks the surface of the transverse undulations forms a decided, though very obtuse set of angles, just like waves rolling along an inclined plane in the direction of its strike. The side ridges are rounded at the top, and while their exterior flanks are more precipitous than the interior

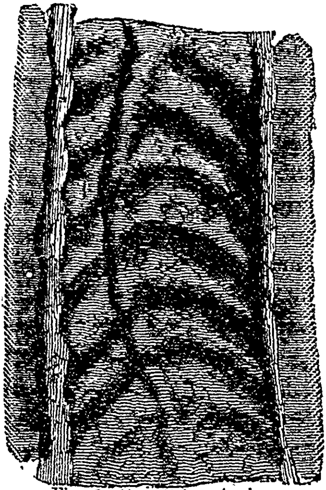


Fig. 5, One-fifth nat. size.

ones, they swell out opposite to each transverse furrow, thus giving to the side ridges a beaded or knotted aspect, each bead of the series standing opposite a furrow. The highest part of these lumps is about three lines above the bottom of the furrows, and about a line and a half above the surface on which the track is impressed.

My naturalist friends to whom I have exhibited the specimens, appear disposed to consider the tracks those of some species of gigantic mollusc, and I am given to understand there is now living some small mollusc, whose track presents a series of transverse ridges and furrows, without, however, the longitudinal ones. From the resemblance of the track to a ladder, the name proposed for it is *Climactichnites Wilsoni,* the specific designation being given in compliment to its discoverer, Dr. Wilson.

ARTICLE XL.—*Notes on the Coal Field of Pictou.* By H. POOLE, Esq., Superintendent of the Fraser Mine.

(Communicated to the Natural History Society by Principal Dawson.)

[The facts contained in the following communication, may be regarded as supplementary to those noticed in my Acadian Geology, and in a paper by Mr. Poole and myself, published in the proceedings of the Geological Society. The coal measures of the Albion mines, dipping to the N. E., at an angle of about 18°, contain the great main seam, 36 feet in thickness, and 157 feet below this the deep seam, a bed of inferior but still great thickness. To the north-west these coal measures are apparently cut off by a great bed of conglomerate dipping north, beyond which occur other coal measures, also with northerly dip. For reasons stated in the publications above mentioned, I regard the great conglomerate of New Glasgow above referred to, not as a recurrence of the Lower Carboniferous conglomerate, but as a bed of the date of the coal formation, a contemporaneous shingle beach, which shut off the Albion Mines coal area, and occasioned its exceptional character. In connection with these facts and views, Mr. Poole's observations bear on the following points; (1). The character of the coal measures below the deep seam, previously little known. (2). The sudden bending of the outcrops of the coal seams to the southward, west of the Albion Mines, so that they assume northerly dips for some distance, though they appear to return to a N. E. dip further to the westward. (3). The occurrence of a narrow and abrupt synclinal immediately to the N. E. of the Albion Mines, succeeded by an anticlinal, near the axis of which in this locality is the outcrop of the great conglomerate. (4.) The results of explorations made in the measures north of the conglomerate, confirming apparently the difference of these in character, from the great coal measures south of the conglomerate. (5.) The frequent occurrence, as at the Joggins, of scales of fishes, bivalve shells, *Cypris* and *Spirorbis* in connection with the beds of "Oil Shale," and coal. I have added a notice of these fossils to Mr. Poole's paper. J. W. D.]

The operations of the Fraser Oil Coal Company were carried on during the past year in a seam of coal and bituminous shale situated upon the Coal Brook, and underlying the seams of bituminous coal worked by the General Mining Association.

The respective out crops of the deep seam and the Fraser oil coal being 528 yards apart on the surface, and the general dip N. 42° E., at an angle of 18 degrees, or 1 to 3, the oil coal will underlie the deep seam 528 feet in perpendicular section.

It is situated about 60 feet below the tabulated section given in Haliburton's History of Nova Scotia, which distance is chiefly occupied by strong bands of sandstone, whose actual thickness is not yet proved, thin soft shales with bands of ironstone, *Stigmaria* with *Sigillaria* and a few detached fern leaves (*Neuropteris*), in such soft shale that I have not been able to preserve any good specimens. Immediately above the oil coal are fourteen inches of bituminous coal, but only the lower four inches are of good quality, the upper part being of a soft friable nature, producing a great deal of ash.

The oil coal has a smooth regular parting at top, next to the coal, as well as at the bottom, next to the oil shale, but varies in its thickness from a few inches up to twenty. Throughout its entire thickness it has a curled and twisted structure, many of its fractures look like the casts of shells, and the sharp edges are polished and stickensided. No fossils that I am aware of, have hitherto been found in the "curly" oil coal, but scales of calcareous spar are often met with in the joints. The oil shale next below is nearly two feet thick, of a homogeneous character with a shaly cleavage of various thicknesses. In this band a few scattered ganoid scales have been found, and two or three varieties of lepidodendron beautifully preserved, also leaves of *Cordaites* of various lengths and breadths, which have undergone so little change, that pieces from four to six inches long, and in breadth about a quarter of an inch, could be removed when the shales were first split, and were so elastic that they could be bent considerably without breaking. In the argillaceous shales below are bands containing innumerable *Cypris* and *Spirorbis* shells. The crop of a small seam of coal which must underlie the oil coal about thirty feet is seen in the brook. There are surface indications of the coal measures continuing for a considerable distance towards the south-west, and this has been proved to be the case by Robert Culton, who is opening up a seam of coal upon his farm upwards of one mile and a quarter distant, to the rise of our mine, which will be alluded to hereafter.

There are numerous small faults running across the measures in the Fraser Mine, which are uniformly downthrows to the west: and I may here mention that I observed some years ago in the deep seam several faults of from four to ten feet each, which could not be found in the main coal workings above (the distance between the two seams is 157½ feet), which shows that the disturbances must have taken place previous to the formation of the main coal seam; a fact which should not be lost sight of in investigating this extensive coal-field.

The oil coal has been traced from the Fraser Mine eastward as far as the main road, but from thence down to the East river there is a great thickness of drift which appears to have cut off the crop. It has not been traced on the east side of the East river, and, although a bed of oil coal has been found and worked by A. Patrick on the McLellan Brook, I am inclined to think it is not a continuation of the same seam, but—from the fossil—sof one much lower down in the coal formation.

To the west the oil coal has been traced for half a mile, with a line of strike parallel to the deep and main seams, or a course about N. 50° W. to the top of the hill, where there is evidently some disturbance, the sandstone appearing on edge and dipping in different directions. It was next found in the McCulloch Brook at a considerable distance up the brook, or to the south of the general line of strike, where it was found to dip 13 degrees, N. 67° W. The oil coal is here of a much richer quality than at the Fraser mine, and from the free way in which it burns, throwing off stars or sparks of light, it has been named Stellar coal to distinguish it, and an adit is now being driven in it back towards the Fraser mine. It also varies in thickness from two to twenty inches, and as the coal roof is regular, I should infer from the twisted appearance of the oil coal that it has been in a pasty state and subjected to great and unequal pressure.

1600 tons of two qualities were shipped to Boston, in 1859, from the Fraser mine, the top seam of curled coal yielded in the D retorts 63 gallons per ton, and the second quality of shale, 45 gallons per ton of crude oil. A small sample of the stellar coal gave 77 gallons per ton of crude oil. I am told that the rotating retorts produce 30 per cent more oil from the same material than the D retorts. Some picked samples from Duncan McKay's adit tried in Boston gave 199 gallons per ton. Torbane Hill mineral yields 125 gallons; the Albertine coal of New Brunswick gives 100 gallons, and the Lesmahago Cannel of Scotland gives 40 gallons per ton of crude oil.

Professor How of Windsor has sent me the following analyses of these coals.*

Fraser Mine	No. 1.	Stellar Coal McCulloch Brook.	
Moisture	0.39	Moisture	0.23
Volatile Matter	33.43	Volatile Matter	66.33
Fixed Carbon	10.78	Fixed Carbon	25.23
Ash	55.40	Ash	8.21
	100.00		100.00

The ultimate analysis of the Stellar Coal yielded;—

Carbon	80.96
Hydrogen	10.15

Two small trial holes have been made by Mr. R. Culton in the bank of the McCulloch Brook at 124½ chains distance from the

* Professor How has since published these and other analyses in a paper in the Ed. New Phil. Journal, and Silliman's Journal.

south division line of the Fraser mine. The coal measures dip N. 40° E. 22°, but as there is the appearance of a fault which has thrown up the measures, they will no doubt be found lying flatter when sunk upon to the deep.

There is here a confusion of seams, consisting of bright bituminous coal, and cannel-like curled oil coal with bituminous shales; in the latter is an abundance of fossils. I obtained *Lepidodendron*, *Cordaites*, and other markings which I have regarded as similar to the *Cardiocarpon acutum* of Mantell; also a stalk, with a head like ryegrass.* One band or more of the shales contains innumerable *Spirorbis* and *Cyprides*, and accompanying them are ganiod fish scales, teeth and spines. Thick plates or scales are also found on the same slab with the *Cardiocarpon.* Similar plates are found at J. McKay's mine south of New Glasgow, as well as in the bituminous shales near Smelt Brook, and at the basin; both of the latter places being to the north of the conglomerate ridge. There are appearances of crops of coal and shales in several places on the McCulloch Brook between Robert Culton's farm and the Fraser mine, but they have not yet been examined.

Proceeding down the McCulloch Brook to the adit worked in the stellar coal, and at about 200 yards distance south, underlying the stellar coal, is the crop of a coal seam about five feet thick, dipping 21° N. 25° W. of inferior quality, with a band of calc spar running through it (the same thing was observed in a trial pit sunk to the rise of the oil coal on Duncan McKay's farm) with *Sigillaria, Stigmaria* and *Cordaites* in the soft crumbing coal, so that specimens could not be preserved; a thin seam of coal with shales lies about 30 feet below the stellar coal dipping 16° N. 55°W.

The stellar coal seam has a black friable clay above the coal, with ironstone balls in the shale above. *Lepidodendron* and *Stigmaria* have been found in the coaly bands, and *Cordaites* in small fragments and one *Cardiocarpon?* (similar to those at R. Culton's seam), have been found in the clay ironstone; also a few ganoid scales and nodules full of soft ochreous matter, of no decided form. The measures here are much disturbed: in the adit on the east side of the McCulloch brook the dip is 13° N. 67° W.; while on the west side of the brook the stellar coal dips 12° N. 45° E.

* Antholithes?

We have not been able to trace the strike of the stellar coal farther west, owing to the covering of drift, which ranges from 40 to 50 feet in thickness between the two brooks. At 220 feet from the entrance to the adit we have cut a fault running north-west and south-east, which is a downthrow to the east, and is the first of that kind that has been met with in the Albion coal field. Its size has not yet been accurately determined, nor whether it is the main fault, or only a branch that has thrown all the coal measures round, and made their outcrops so much farther south than the general strike at the Albion Mines indicated *.

Descending the McCulloch Brook, but in ascending order for the measures, some trial pits and boreholes have been sunk, but only thick beds of fire-clay and black shales discovered ; at 15 chains distance from the stellar coal is the crop of a coal seam, thickness not satisfactorily proved,-with a band of shale full of *Cypris*, dipping N. 20° W. At the next bend of the brook three chains distant is the outcrop of beds of sandstone dip N. 22° E. 15° ; and three chains further on is a coal seam five feet or more in thickness, with bands of shale intermixed dip N. 26° E. 7¼°; thence the distance is five chains to the old Middle River Telegraph road, where there is another crop of a coal seam, which I believe to be the continuation of the deep seam of the Albion Mines ; dip 12° due north. Here also the measures are disturbed by small faults, and the pit is sunk on the crop, so that we cannot judge very correctly of the actual thickness, or quality of the seam. Nineteen feet 5 inches of coal have been sunk through, of which Mr. Fraser is working the lower 7 feet 3 inches ; I have made the following analyses.

Deep Seam		Sp. Gr.	Vol. Mat	Coke	Fixed Carbon	Ash		Color of Ash.
No. 5 Band 1	2.9	1.355	22.50	77.50	67.00	10.50	Cokes	Grey white.
2		1.383	22.25	77.75	60.50	17.25	do	Dun.
3		1.342	21.50	78.50	70.25	8.25	do	Dun white.
No. 6 Band	2.0	1.440	20.00	80.00	57.00	23.00	do	Grey white.
No. 7 Band	2.6	1.335	20.00	80.00	68.00	12.00	do	Dun white.
Worked	7.3 .							

Lepidodendron got in No. 6. Band.

Eight chains further north is the crop of another coal seam which shows in the brook for a breadth of two chains, and therefore corresponds with the main seam. *Stigmaria* was got in the

* While I am writing we have struck another fault bearing N. 8° W., S. 8° E., dipping S. 82° W. 45°, being an upthrow to the east, and of which the first fault is a branch. It is eight feet up as far as we have gone, and we are not yet through it.

underclay at a small trial pit. The shales and sandstones dip south on the old Glebe and Duff's farm to the north of the Association's reservation; and at the Burial ground I found by the bank of the East river the measures dipping S.20° E.63°; showing ripple marked sandstone, *Calamites* and *Stigmaria*: the shales contained *Cypris*. At the Gondola wharf the shales dip S. 45° E. 50°; and by the side of the old quarry road (Fraser Ogg) we sank a pit 15 feet and got one foot of the curly oil coal, dip S. 20° W. 50, but it thinned out in going down and was close on the conglomerate.

At the Basin there are several thin seams of bituminous shale. An inch of coal shows about fifteen feet above the shale at the dam, containing fish remains, but it did not appear in the trial pit. The position and thickness of the bed containing the fish remains and *Cypris* corresponds with the upper seam of bituminous shales on the opposite side of the East river. They yield upwards of 60 gallons of crude oil of superior quality to the ton; but are too thin to be worked profitably.

We are now boring to prove the measures at Mathieson's farm opposite to the Loading ground, and have sunk a pit down 14 feet on drift gravel and clay, then 5 feet of soft blue sandy clay with no regular cleavage, full of fossils. I obtained *Lepidodendron*, *Lepidostrobus*, *Calamites*, *Pecopteris*, *Neuropteris*, and fragments of other plants, but the clay was soft and crumbled immediately on exposure to the atmosphere so that I could not preserve good specimens: then followed three inches of black friable clay; then 1.3 of good coal yielding water, dip 5° N. 25° E.; succeeded by strong grey sandstone, through which we are now boring. At Forbes's Point a borehole was put down 75 feet but nothing obtained but red and white sandstone in thick beds.

At low water an inch of coal and fire-clay is seen to crop out upon Skinner's point but nothing else has been observed along the shore of the Middle River.

Returning up the East river to Smelt Brook, several seams of bituminous shale and sandstone appear in the bank, also one small seam of an inch of coal, with sandstone bands of different thicknesses and qualities; the No. 1 and 3 seams of shale are particularly full of fish remains and coprolites near the roof, and the large plates appear like *Glyptolepis* figured in Miller's Testimony of the Rocks, page 229: I also found one or two grooved plates which correspond with the *Osteolepis*. The roof of No. 1

seam is one mass of *Cypris* shells; No. 2 contains principally small ganoid scales; No. 3 seam has small fish jaws and small *Lepidodendron and Poacites* on the roof.

The sandstone bands contain *Calamites*, and large roots of *Stigmaria* with their accompanying rootlets. Here the inch seam of coal appears below the bands of bituminous shale succeeded by the *Unio* shells, unless fault has caused the outcrop of these bands to be repeated.

Ascending the East river and to the south of Smelt Brook, is a thick band of coarse sandstone full of hard flattened red concretionary balls and ripple marked; then comes a four inch band, of honey-combed, concretionary limestone, in which I have detected a piece of shell in the fresh fracture, and which looks like the metamorphic rock near Churchville. I could not find any fossils in the pit sunk at Sinclair's cove.

The adits driven in upon the coal to the south of New Glasgow, by the side of the road to Antigonish, are upon the anticlinal axis; both mines have the same fish remains in the roof, and limestone pavement, and cannot be worked far to the northwest before they will be cut off by the conglomerate. The fish teeth are abundant in the roof. In one slab four by six inches, I counted fifteen large *Diplodus* teeth. Higher up the brook and road, I am told, the crop of the coal shows a dip to the N. W.. but I have not yet seen it.

The shales and coal up the McLellan Brook, dip from E. by the bridge at George Fraser's farm, to S. 15° E. at Turnbull's farm, then the measures are reversed, and at A. Patrick's adit, they dip N. 45° E. 30°; where the oil shales have been worked for about 100 feet, and having struck a fault have been cut off by the other shales dipping S. 20° E. 25°. Mr. Patrick has proved a seam of bituminous coal about three feet thick, dipping to the N. E. underlying his oil shales near the foot of the mill dam, in addition to the small seam which shows in the bank of the mill pond. I am told that the high conical hill just verging to the south, contains iron ore, and that it is succeeded by limestone.

[Among the fossils sent by Mr. Poole, the most interesting are the following:

Of placoid fishes there are, 1. *Diplodus penetrans*, N. S. This is smaller than the species *D. acinaces*, found commonly in the upper part of the Albion Main Seam, and described by me in a supplementary chapter to my Acadian Geology, now in press

The height of the tooth is 2½ lines, and almost equal to the breadth. The lateral denticles half as broad as high, flattened and serrated, especially at the outer margin and near the base; cross section of the denticles rhomboid. They diverge at an angle of 35° to 40°. The central denticle is minute and conical. 2. *Ctenoptychius*, a small species indicated by a tooth with eight denticles. The specimen is an imperfect impression.

Of ganoid fishes there are numerous scales of small species belonging to *Palaeoniscus* or allied genera, broad flat scales punctured and lined after the manner of *Osteoplax* of McCoy, and others marked with fine wavy lines, as in *Holoptychius* or *Rhizodus*. There is also a curved conical tooth belonging to one of these latter fishes, and differing from others that I have seen in having the concave side marked with fine spiral ridges nearly to the point. There are also certain flat sabre-like spines of small size, but much resembling in form those of the Devonian *Machæracanthi.*

The above are chiefly in the coals and shales overlying or near the great conglomerate. In the lower measures at McLellan's Brook, are bivalve shells of that modiola or unio-like form, characteristic of the fresh and brackish water portion of the coal measures, and which I have elsewhere designated by the generic name *Naiadites.* They are all thin, inequilateral, toothless, and marked by concentric lines of growth. A new species in the present collection, *N. obtusa*, is characterized by the broad and truncate outline of the anterior extremity, giving it a somewhat quadrilateral form.

The *Spirorbis* found abundantly in several of the beds noticed, is the ordinary *Sp.* (*Microconchus*) *carbonarius* common to the American and European coal fields.]

ARTICLE XLI.—*On new Localities of Fossiliferous Silurian Rocks in Eastern Nova Scotia.* By REV. D. HONEYMAN.

(Read before the Natural History Society.)

This subject has already been very fully discussed in Dr. Dawson's Acadian Geology and in his recent paper read to this Society, with Professor Hall's elaborate and valuable Memoir on the Fossils of Arisaig.

A few notes by another observer who is now labouring in the same interesting field may not be unnecessary and unacceptable. A catalogue of the most interesting Silurian Sections in Nova Scotia is already given in the paper referred to. To this I would now add two altogether new and equally interesting localities, which I shall endeavour to describe, adding some observations upon a supposed extension of the Arisaig Section.

The first of these localities is to the S. W. of Merigomish in the county of Pictou and on the north of the Metamorphic hills that extend between Barney's River and East River, *vide* Dawson's Geological map of Nova Scotia. The first and lowest part of the section, as yet observed, occurs at a place where the Antigonishe and New Glasgow new road crosses a small brook about 3½ miles west of Barney's River and to the east of French River and about 5 or 6 miles from the Gulf of St. Lawrence. Here there is a quantity of shale which is apparently very little altered, having fossils in good preservation. At the side of another small brook to the westward, we have similar shale with correspondeng fossils. This appears to be equivalent to the Arisaig group of Clinton age, as we have here the *Graptolithus Clintonensis*, *Strophomena corrugata* and a species of *Orthis* which is characteristic of the Graptolite shale of Arisaig; we also found a trilobite which is however different from any that has been met with at Arisaig. We have also fossils like those of the upper Silurian group of Arisaig, abounding in the drift from French River, till near Sutherland's River, where there is a small brook which is crossed by the road already referred to, and which has on the one side drift with Silurian fossils and on the other or northern side the lower carboniferous Conglomerate.

Among these fossils we find *Homalonotus Dawsoni*, *Dalmania Logani*, *Beyrichia pustulosa*, *Chonetes N. Scotica*. *Chonetes tenuistriata*, *Crania Acadiensis* and other organisms characteristic of the Arisaig series.

There is thus every reason to suppose that we have here discovered a section exactly parallel to that of Arisaig. On account of its inland position we cannot have the aid of old Neptune in disentombing its ancient inhabitants, so that its fauna cannot be collected and studied with equal advantage. It is nevertheless to be regarded as interesting on account of its similarity; and as collections of its organisms even under existing circumstances are by no means insignificant, either in number or variety, it is possible that a detailed examination of this new locality may aid in unravelling some of the Arisaig mysteries.

The second new section to which we would refer is situate at the head of Lochaber Lake in the county of Sidney, and on the east of the Ohio River. It appears to extend about 2 miles from N. to S. on the west side of the lake. The strata consist of grey slate which has been very much hardened and thrown into a vertical position. The fossiliferous strata appear only on one side of the lake, except where it bends in a westerly direction, and the highest of the Lochaber hills approaches the lake, and then a patch of the grey slate appears on the opposite side. A small lake to the west of the great lake, and from which a stream flows into the Ohio River, bounds a considerable part of the western side of the section. Where the strata are exposed on the highest or S. W. side and in the beds of two or three small brooks, fossils are found *in situ*. Their number is considerable but their variety does not yet appear to be great.

In consequence of the highly altered state of the strata, casts only are found, but these are often very beautiful. In this state we have abundance of *Pentamerus*, *Orthis*, *Cornulites* and corals. These all appear to be characteristic of this section. A conical or turbinated species of coral is peculiarly so and is of very frequent occurence and often very perfectly preserved.* It is truly beautiful, and appears to the common observer as the most striking of the Nova Scotia silurian fossils in my collection.

I have also found here, but not in situ, a cast of a large *Orthoceras*. Its length is 8 inches—it tapers very little—the siphuncle is central—cross section is elliptical having a transverse diameter of $1\frac{1}{2}$ inches and a conjugate diameter of 1 inch. The fossils of this section are generally found like our elegant coral and *Orthoceras* in the cairns piled up by the farmers in the overlying fields. In the cairns of the northern part of the section the fossils appear chiefly to correspond with those of the upper group of Arisaig. Here we have the *Dalmania Logani* the *Calymene Blumenbachii* the *Bellerophon trilobatus*, and a tuberculated crinoid, so that it is possible we have here an equivalent of the upper Arisaig groups as well as a lower group probably the equivalent of the Wenlock limestone of Murchison.

I hope yet to have opportunities of examining these sections

* A *Zaphrenitis*, see note.

more in detail, and of submitting full collections of their fossils to the proper authorities, in order that their true age and the character of their organisms may be determined.

I would refer also to a subsection, which although not so interesting to the collector may be of equal interest to the geologist, as it is possibly to be regarded as a descending continuation of the Airsaig section. It occurs at Doctor's Brook about $2\frac{1}{2}$ miles east of Arisaig Pier. This will make the whole Arisaig section extend about 5 or 6 miles S.E. and N.W.

The Silurian strata are here very much altered and distorted, arising, as Dr. Dawson has already observed, from volcanic action of the carboniferous era. Of this there are obvious remains existing at various points along the sea shore from the conglomerate on the east to the conglomerate on the west of the Arisaig Silurian strata, or from Malignant Brook till beyond McCara's Brook, a distance of at least ten miles. In Malignant Brook and a little brook to the eastward, we find subcrystalline trap in immediate contact with the lower carboniferous conglomerate, and the latter has consequently become very much hardened; to the west of this the section is obscure and depressed till we reach a small brook having elevated ground on its western side, and there is no appearance of rock of any kind until we meet the subcrystalline trap and altered Silurian strata of Doctor's Brook. From this point to Arisaig Pier we find the same kind of trap in contact with the Silurian strata, and converting these into a red jaspidaceous rock or otherwise hardening and altering them in proportion to their proximity to the point of contact. The results are the conspicuous red and oblong rock locally known as the "Frenchman's Barn," the breakwater of Arisaig pier, the hardening and tilting of the slate and shale near the Frenchman's Barn and the prevailing disorder of the Arisaig Section.

When we again meet with volcanic rock, it assumes the form of beds of amygdaloid associated with the lower carboniferous conglomerate at McCara's Brook.* This rock has suffered much from denudation as is evident from the horizontal section on the beach; a large mass has been dislodged by the frosts of last winter and it is evident that after a number of years it will entirely

* For a detailed notice of this place see *Journal of Geological Society Vol.* 1. p. 239.

disappear and the present picturesque appearance of this part of the section be materially affected or destroyed.

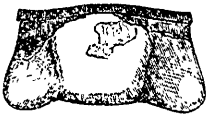
The distorted shale at Doctor's Brook contains fossils, but these are by no means abundant or of a superior grade. After a strict search I have found a bed of *Lingula* of two or three varieties, associated with a group of a small species of *Orthis.* In another place, I got the casts of a delicately striated shell resembling a compressed *Chonetes*, an impression of the aster of a small crinoid joint, and at some distance to the south I met with one or two *Lingula cuneata?* one specimen of which measures from the umbo to the base 9 lines, and a shell of a different kind, resembling in shape *Clidophorus concentricus*, but having the surface marking *reticulated.* I will take an early opportunity of transmiting the cast of this and duplicates of the others for determination. These fossils were found in situ, and they lie at right angles to the slaty fracture.

The masses of trap, the Frenchman's barn and the rugged crags at the mouth of Doctor's Brook, shew that in this region the volcanic action has been very violent and the fossiliferous strata have been so distorted that there is for a considerable distance southward no appearance of stratification remaining. The lofty banks of shale present this aspect until we reach a point in the brook where a Plutonic rock again appears, there is then an interval and the shale then appears to dip at a certain angle and in a uniform direction. This igneous rock appears to indicate the reason why the preceding strata have been so much shattered and distorted,—to shew that they have been subjected to the violent action of igneous forces before, beneath, and behind.

(*Note by Dr. Dawson.*)

[The observations recorded in the above paper by Rev. Mr. Honeyman are of much interest. They establish the continuation of the Arisaig line of outcrop to the East River, as suggested by me in my paper lately published in this Journal. They make known for the first time the occurrence of fossils at Lochaber Lake, in rocks supposed from their mineral character to be of the age of those of Arisaig and N. Canaan. The fossils found by Mr. Honeyman confirm this view, and probably also indicate the occurrence there of another and perhaps newer group, similar to that of Nictaux. The position of this place accords with the idea of a succession of anticlinal and synclinal folds proposed in my paper. Mr. Honeyman has also apparently extended the Arisaig series downward by the discovery of fossils in the slates of Doctor's Brook, in which I have often searched in vain for such remains. I shall look with much interest for specimens from this place.

Among the fossils kindly sent to me with the paper, are some throwing new light on species previously imperfectly known, and others that are new to Nova Scotian Geology. The following especially deserve notice.

Fig. 1.  *H. Dawsoni.*

1. *Homalonotus Dawsoni,*—(Hall.) The caudal shield and portions of the articulations of the body, were the only parts known when the species was described by Prof. Hall. Mr. Honeyman now sends nearly perfect specimens of the head. It has the posterior border nearly straight, the glabella moderately prominent and slightly wider behind than before. It descends abruptly in front, and the frontal margin, which is absent in the specimen figured, appears to have risen in front of the glabella and eyes, with equal abruptness. The eyes are large and prominent, and advance into a line with the front of the glabella. Some of Mr. Honeyman's specimens shew that the species attained to a considerable size, at least three times that indicated by the head now figured. (Fig. 1 above.)

2. *Phacops Stokesii,*—(Edwards.) A cast of a head referable to this species, for notice of which and the closely allied *P. Orestes,* (Billings.) see Mr Billing's paper in Canad. Nat. vol. 5, pp. 65 and 66.

Of two other trilobites, fragments of which have been sent by Mr. Honeyman, one is according to Mr. Billings, a *Proetus,* the other a *Dalmania,* allied to *D. socialis.*

3. *Orthoceras exornatum,* N. s. This very prettily marked species is circular in its cross section, moderately tapering and straight, with siphuncle slightly eccentric, and septa half a line to a line apart, in a specimen two to four lines in diameter. The surface is slightly annulated and ornamented with about twenty-four flat longitudinal flutings in the manner of a Doric column. The whole surface is also delicately striated transversely. In

some respects it closely resembles *O. canaliculatum,* (Sow.) of the English Wenlock.

4. *Theca Forbesii,*—(Sharpe.) A little Pteropod in Mr. Honeyman's collection, appears perfectly identical with this species which is found in the Ludlow of England, and which resembles the *T. triangularis,* (Hall) of New York.

5. *Pleurotomaria,*—A flattish species with four turns, and interesting as being apparently the same with one common in the supposed equivalent of the Upper Arisaig group at Nictaux.

6. *Platyostoma,*—A species allied to *P. Niagarensis* of Hall.

7. *Bellerophon,*—Diameter, ¼ inch, carina prominent and broad, outer and umbilical slope of whorls steep and straightish, so as to give a somewhat rhomboidal cross section, surface with strong sharply waved transverse striæ, crossed by finer longitudinal striæ, cast of interior nearly smooth, with traces of transverse striæ. This shell much resembles Hall's *B. stigmosa* from the Clinton.

8. *Bellerophon.*—Two imperfect casts representing forms similar to *B. expansus* and *dilatatus.*

9. *Zaphrenitis,*—A cast not sufficiently perfect for specific determination, but not unlike imperfect specimens from the Devonian of Nictaux. This specimen is from Lochaber Lake.]

ARTICLE XLII.—*Note on a specimen of* Menobranchus lateralis, *taken at London, C. W.* By W. SAUNDERS, Esq.

Total length 4½ inches; body 3 inches; tail 1½ inches. Dull olive on the upper surface, the under of a dull, pinkish colour. A dark (not well defined) stripe, mottled olive and black, running from the head (where it is wide) to the tail, where it tapers off to a point. Broad stripes of the same character from the mouth along each side to the tail. The legs are very short, not quite half an inch long. On each foot there are four toes The legs are olive with black spots, but the tips of the toes are of a light colour. The eyes are very small and not readily seen. The head is flat and almost triangular on its upper surface. The branchial plumes are six, three on each side, about an eighth o an inch long, and of a bright red colour which can only be seen when they are extended in the act of breathing.

The animal was found in the river Thames, close to this city between two and three months since, in a half torpid state, under a large stone. It was immediately transferred to my aquarium where it has since been constantly under my eye. When first placed there, it at all times sought places of concealment, where it would remain for days without being seen, unless when forced, for a time from its hiding place. But several times at night when a light has been suddenly thrown upon the aquarium, I have observed it swimming about very actively. Within the last month its habits have somewhat changed. Up to that time I had never seen it eat anything. One day, however, while feeding the fish with some water insects, one came very near his mouth. The wave-like motion produced by the numerous legs of the insect attracted the attention of the Proteus. A newt standing very near, was also attracted by the movements of the insect. The sight was now truly interesting, both animals were just ready to seize upon the prey. The newt being the more active made the first movement and caught it by the tail, just at the moment when the Proteus was ready to seize it by the head. The Menobranchus not observing that the insect was already captured, opened its capacious mouth, and in attempting to seize it took the head of the newt as well as the little creature, into it. There they stood in mute astonishment. The Proteus evidently thought his eyes had much deceived him with regard to the size of the object of his attack, for he found his ample mouth well filled by the head of his companion. After the lapse of about half a minute, the newt showed symptoms of uneasiness, and began to wriggle about, when the Proteus let loose his hold, allowing the newt to escape unhurt, still holding the insect firmly in its mouth. This I concluded was his first attempt at feeding by day and rather a clumsy attempt it appeared to me to be. I immediately gave him a chance at another insect at the same time keeping his companions at a distance, which he succeeded in capturing. Since that time he has repeatedly eaten pieces of worms and young tadpoles, and although he grows more expert, his movements by day are still slow and awkward. Of late he seems to be gradually growing out of his retired habits, and although he sometimes now hides himself from view, still he may be frequently seen perambulating slowly up and down the bottom of the aquarium, as if in search of food. Before this change took place it was a rare thing to see him come to the surface for air, but now he rises many times a day.

About a month or six weeks since, I caught another animal of the same class, but of a different species or variety. I caught it while dredging a small muddy pond, (left by the subsidence of the river) for the larvæ of dragonflies, and at the time I supposed it to be a newt. This animal was not more than an inch and a half, or two inches long, with the stripes on the body well defined, and of a purple or dark red colour. The branchial plumes, legs, and other parts of the body were proportioned, in about the same manner as in that last described, but it was a very much prettier animal. Unfortunately it died, and was partly eaten (I suppose by the cray fish) when I discovered it, otherwise I would have preserved it. I have made repeated attempts to procure another specimen but without success.

ARTICLE XLIII.—*On some new species of Fossils from the Limestone near Point Levi opposite Quebec.* By E. BILLINGS.

On examining the specimens recently collected at this locality I find some evidence of several groups of species, each occurring in a rock somewhat different in appearance from that which contains the others. It does not seem improbable, judging from the fact that all the three varieties of limestone occur in close proximity to each other, that these species may yet be found more or less intermingled in the same beds, but for the present it is best to keep them separate. I shall designate the rocks simply as limestones Nos. 1, 2, 3, and 4. The genera collected in each are as follows.

No. 1. *Lingula*, 2 species. *Discina*, 1. *Agnostus*, 3. *Cono cephalites*, 1. *Arionellus*, 4. *Dikelocephalus*, 6. *Bathyurus*, 4. Total 21.

No. 2. *Dictyonema*, 1. *Lingula*, 1. *Orthis*, 2. *Strophomena*, 1. *Camerella*, 1. *Cyrtodonta*, 1. *Murchisonia*, 3. *Pleurotomaria*, 7. *Helicotoma*, 2. *Straparollus*, 2. *Patella*, 2. *Ecculiomphalus*, 2. *Orthoceras*, 5. *Cyrtoceras*, 4. *Agnostus*, 1. *Bathyurus*, 4. *Cheirurus*, 2. Total 41.

No. 3. *Asaphus*, 2.

No. 4. In a fourth mass of limestone imbedded in the cliff, near the ferry, a coral which resembles a *Tetradium* with very fine tubes and an *Orthis* of the type of *O perveta* were found.

One of the species of *Lingula* and apparently *Agnostus Orion*, are common to Nos. 1 and 2.

The following list gives the total number of species discovered in the several limestones above designated at this locality up to the present date.

No. 1	21	species.
2	41	
3	2	
4	2	
	66	
Deduct common to 1 and 2	2	
Total....	64.	

The formation of slate and shale in which these limestones are imbedded, contains as I am informed, about thirty species of graptolites and other allied fossils; and besides these, two species of *Lingula*, an *Orthis*, a *Discina*, and a minute trilobite which will probably constitute a new genus.

The slates and limestones, according to the above, hold about 100 species, and it is more than probable that this number will be much increased by future discoveries.

In this paper I shall notice only the trilobites found in the limestones.

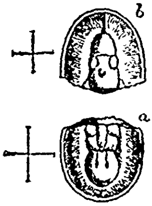
The other fossils appear to be nearly all new species and must remain over for another paper.

All the specimens described in this article were found in the conglomerate limestones near Point Levi opposite Quebec, and to save space I shall not repeat the locality after each description. It is not yet decided whether the fossils occur in the boulders of the conglomerate or in matrix.

Agnostus Americanus. N. s.

Fig. 1.—*a. b.*

Description.—Head oblong semi-oval, rather strongly convex, most elevated at the posterior one-fourth of the length, thence descending with a depressed convex slope in all directions to the sides and front; margin with a very narrow projecting border. The glabella is elongate oval; width, one-third that of the whole head; length, rather more than two-thirds the length of the head. It has two transverse furrows which completely or partially divide it into three segments. The anterior furrow extends all across at one-third, or a little more, of the length from the front. The posterior furrow is interrupted in the middle and is only distinctly seen on each side, penetrating one-third the width, while its position is a little in advance of the posterior third of the length of the glabella. The space between the two inner extremities of the posterior furrows is occupied by a low conical tubercle, with the apex directed backwards. At each side of the glabella at the posterior extremity there is a small triangular lobe. The glabella is defined all round by a very narrow groove, just distinctly visible to the naked eye, and from the apex a similar groove runs straight to the middle of the front margin. The surface is ornamented by from fifteen to twenty irregular, slightly impressed, radiating rugose striæ.



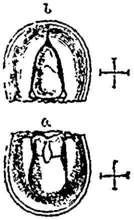


Fig. 1. Fig. 2. Fig. 3.

Fig. 1.—*Agnostus Americanus*; *a*, the tail; *b*, the head? Both a little magnified.

Fig. 2.—*Agnostus Orion.* Natural size.

Fig. 3.—*Agnostus Canadensis*; *a*, the tail; *b*, the head? Both magnified.

Note.—*All the figures in this article are of the natural size, unless otherwise specified.*

In the pygidium the posterior segment of the median lobe is equal to the two anterior in size; and there are no triangular lobes at the anterior margin. The tubercle is well developed, and its backward sloping apex reaches nearly to the posterior furrow. It seems to divide the two anterior segments so that each has a sub-quadrate lobe on each side. The surface is striated like the head. Two heads and one tail have been found.

Length of the tail three lines and one-fourth; of the largest head, three lines. and of the other two lines and three-fourths. The width is about equal to, or a little less than the length.

The contour appears to be not a regular semi-oval; the sides and terminal margins being only gently convex, and the angles broadly rounded.

The structure of the tail is similar to that of both *A. tardus* (Barrande) and *A. glabratus* (Angelin) but in these species the median lobe of the head is smooth and consists of one plate only, without furrows.

It may be that the tail above figured belongs to a different species, but even if that should be the case it is specially distinct from *A. tardus* and *A. glabratus*, for these are both smooth, while ours is striated like *A. exsculptus* (Angelin), and besides the proportions of the parts are sufficiently different to be of specific value, especially when the character of the surface is taken into account. *A. tardus* and *A. glabratus*, both belong to the upper part of the lower Silurian. *A. exsculptus* to Angelin's Region B, which is the upper division of the Primordial Zone in Sweden.

In Limestone, No. 1.

Agnostus Orion. N. s.

Fig. 2.

Description.—Length and breadth about equal, sub-circular, convex a very narrow margin all round, glabella not quite two thirds the whole length, very convex, a transverse furrow at one third the length from the apex, a small triangular tubercle at each side next the posterior edge; no tubercle visible on the top of the glabella. A fissure from the apex of the glabella to the anterior margin. Length two lines.

This species only differs from *A. pisiformis* as figured by Salter in the 3rd Edition of Siluria by having the glabella proportionally shorter.

Limestone, No. 1. In No. 2 there are two specimens of an *Agnostus* which resemble this species but more are required to decide whether they are identical or not.

Agnostus Canadensis. N. s.

Fig. 3.—*a. b.*

Description.—Head, obtusely oblong, semi-oval; width, a little greater than the length; a concave border nearly as wide as the glabella all round. Glabella in width, less than half the width of the head, and in length, a little more than two-thirds the length of the head; a triangular tubercle on each side at the neck, and a transverse furrow a little in advance of the mid-length; the tubercle is obscure and appears to indicated by the small indentation forward in the middle of the transverse furrow.

The specimen represented by Fig. 3, *a*, is provided with a tubercle, but I cannot see in which direction the apex is directed, and consequently am unable to say whether it is a head or a tail. It has the broad margin of Fig. 3, *b*, and I think therefore it belongs to the same species. The segment next the thoracic extremity is a little less than one-third the whole length, and about one-third the whole width. The anterior segment is large and convex, extending quite to the concave border, where it is full one-half wider than it is at the suture between it and the smaller segment. The tubercle is situated in the transverse suture, and makes a small indentation in the edge of the larger segment.

Length of the specimens, about two lines.

Limestone, No. 1.

CONOCEPHALITES ZENKERI. N. s.

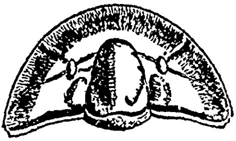


Fig. 4.

Fig. 4. *Conocephalites Zenkeri.*

Description.—Length apparently about two inches. Head very convex, nearly semi-circular with a strongly elevated thin sharp margin all round the front and sides, and just within this a wide deep uniformly concave furrow, the width of which is equal to about one third the length of the glabella. The posterior margin is strengthened by the neck segment which extends the whole width of the head, and becomes much elevated on approaching the outer angles. Glabella conical, very convex, most elevated at about the mid-length, with a well defined neck furrow, the posterior lateral furrows directed obliquely forwards at an angle of 45° with the longitudinal axis of the body, their inner extremities separated from each other by full one third the width of the glabella; the posterior lobes sub-triangular, their anterior angles situated at nearly one third the length of the glabella forward excluding the neck furrow and segment; the middle lateral furrows represented by a small depression or indentation on each side situated on a line drawn across the head passing through the posterior half of the eyes; in front of these a much smaller indentation on each side representing the anterior furrows. The eyes are small and conical, situated on a line crossing the glabella at one half the whole length of the head, their distance from the glabella equal to one-third the width of the neck segment; ocular ridge extending from the eye forward to a point situated a little in advance of the anterior lateral indentation or furrow of the glabella. From the eye a strong ridge runs outwards to the margin of the head in two of the specimens, but in another it is not seen. Between the eye and the posterior margin and situated near the posterior lobe, on each side is a large sub-semicircular tubercle. This elevation is very slight in the small specimens. The surface of the glabella and cheeks adjacent thereto are apparently smooth but the whole of the concave border around the head is ornamented with fine rugose striæ distinctly visible to the naked eye.

Length of head in largest specimen seen eight lines; length of glabella six lines; width of head fifteen lines; width of glabella four lines; distance between the eyes six lines.

Thorax and pygidium unknown. I have not ascertained whether the posterior angles of the head are rounded or produced into spines.

Limestone No. 1.

Genus Dikelocephalus. Owen.

In the species which I have referred to this genus, the general form and aspect of the glabella and pygidium and the course of the facial suture are the same as in *D. Minnesotensis* the type of the genus specimens of which I have before me from the sandstone of the Western States. From numerous fragments of *D. Oweni* exhibiting the underside of the head, I have ascertained that the facial suture does not separate the cheeks from each other by cutting the fold of the margin. The head is therefore composed of three pieces only,—the glabella, hypostoma and united cheeks. This separates the genus from *Proetus*, some species of which, such as *P. striatus* (Barrande) have an expanded front margin and a spinose pygidium very like those of *D. magnificus*. The head of *Proetus* consists of five pieces. The hypostoma found associated with our specimens is much like that of *Proetus*, and it is also not unlike that of *Ogygia*. According to the figure given in

SILURIA, plate 3, fig. 2, representing the sub-marginal fold of the cephalic shield, and the hypostoma attached thereto of *Ogygia Buchii*, the structure of the head of *Ogygia* must be the same as that of *Dikelocephalus.* The affinities of the two genera are still further indicated by the form of the glabella.

DIKELOCEPHALUS MAGNIFICUS.

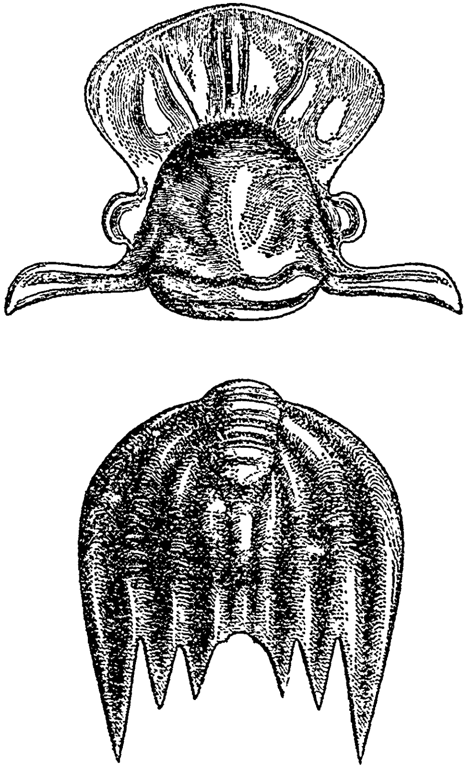


Figure 5.

Fig. 5.—Glabella and pygidium of *D. magnificus.*

Description.—Eight or nine inches in length. Head large with a short broad obstusely conical depressed convex glabella in front of which there is a broad flat margin with from five to eight obscure radiating ridges. The neck furrow is represented by an obscure shallow groove which is visible in the middle two thirds of the width but dies out before reaching the sides of the glabella. In front of this there are from one to three shallow pits or faint depressions on each side of the median line representing the glabella furrows. A line drawn across the head at one third the length from the posterior margin would pass through the centres of the eyes nearly. The eyes are annular about one sixth the whole length of the head, situated their own length from the posterior margin and with their centres about the same distance from the side of the glabella. The facial suture runs from the inner anterior corner of the eye forwards and outwards at an angle of about 45° to the longitudinal axis of the body until it crosses a line drawn through the eye parallel with the axis of the body and having gained a point situated outside of this line at a distance from it equal to the length of the eye or thereabout it curves inward and reaches the front margin at a point somewhere near the line. It then appears to run round the margin. Behind the eye its course is, after a short inward and backward curve, directly outwards nearly parallel with the posterior furrow apparently one half the width of the cheek when it curves back and cuts the posterior margin before reaching the angle. On each side of the glabella nearly opposite but a little behind the position of the eye there is an obscure rounded elongated prominence.

Judging from several detached cheeks the posterior front of the head must be very wide and the angles produced into moderately long triangular spines.

The pygidium is somewhat fan shaped, the posterior margin terminating in six triangular points or spines, the outer ones of which are the longest and the inner ones diminishing in length so as to produce a semicircular emargination for the posterior outline. The greatest width of the pygidium is at about one third its total length from the front measuring to the extremity of the longest spine. In front of a line drawn across at this place the contour is nearly semicircular but behind the line the sides are straight or only gently convex and somewhat parallel slightly converging towards each other. The main body of the axis is about one fourth the total length, convex conical and with four shallow concave transverse grooves. Four ribs in each of the side lobes besides a rudimentary ridge along the middle being a continuation of the axis. The surface is marked by fine fissure-like undulating lines.

The pleuræ which seem to belong to this species are broad, flat, falcate and with a moderately strong groove running obliquely nearly their whole length.

Judging from the form of the three pygidia figured by Angelin on Plate 41 of the Palæontologia Scandinavica, it appears probable that this species connects *Dikelocephalus* with *Centropleura* a genus which occurs in the base of the Lower Silurian of Sweden, in Regio B and C of Angelin. It is perhaps an extreme form but the course of the facial suture and characters of the glabella are the same as they are in *Dikelocephalus*. The pygidium differs from *D. Minnesotensis* in having fewer ribs and a greater number of spines, but this difference is not of itself I think of generic value.

Limestone, No. 1.

Dikelocephalus planifrons. N. s.

Fig. 6.

Description.—Head with a broad smooth margin in front, the width of which is about equal to the width of the glabella: the latter oblong conical rather flat most elevated along the median line, broadly rounded in front, its sides nearly straight and sub parallel slightly converging from behind forwards. On each side of the median line there are three or four obscure depressions

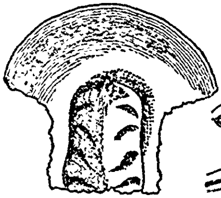


Fig. 6.

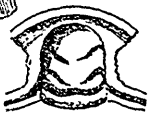


Fig. 7.

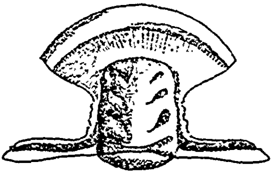


Fig. 8.

Fig. 6—*.D. planifrons.*
Fig. 7.—*D. Belli.*
Fig. 8.—*D. Oweni.*

which represent the glabellar furrows. The length of the glabella appears to be about once and a half its width at the neck segment. Eyes, cheeks, thorax and pygidium unknown. Length of largest head seen, twelve lines; length of glabella, seven lines; width of glabella at base five lines, at front margin four lines and a half.

The head of this species differs from *D magnificus* in having a more elongated and depressed glabella with the wide border in front smooth instead of ornamented with radiating ridges.

Limestone, No. 1.

DIKELOCEPHALUS OWENI. N. s.

Fig. 8.

Description.—Head with a broad punctured and striated margin in front of the glabella; the latter oblong conical depressed, most elevated along the median line and with from two to four obscure depressions on each side, representing the glabellar furrows. The front of the glabella is broadly rounded, the sides straight or nearly so, sub-parallel or slightly converging from behind forwards; the posterior margin straight in the middle, turned forward at the sides. At the base of the glabella there is an obscure transverse furrow and I am not sure whether this should be regarded as the posterior glabellar groove or the neck furrow. The front of the head is strengthened by a depressed convex rim just within which there is a curved row of punctures, four or five in one line. From these punctures fine somewhat flexuous striæ converge towards the front of the glabella. Eyes, cheeks, thorax and pygidium unknown.

Length of head of a specimen which appears to be of the average size ten lines; length of glabella, seven lines; width of glabella at neck segment, five lines and a half and at front margin four lines and a half; width of the marginal rim, one line and a half.

The depressions representing the glabellar furrows are sometimes obsolete and sometimes only one or two are visible on each side.

One of the specimens has the anterior striated margin proportionally one fourth narrower than the above and only five punctures in the width of one line. The glabella is smooth and not narrowed in front. I do not at present think, however, that these differences are of specific importance.

In another specimen where the crust is preserved the punctures are scarcely visible but where it is removed they are distinct.

Dedicated to Dr. D. D. Owen, whose extensive geological researches in the Western States have been of such great service to science.

Limestone, No. 1.

DIKELOCEPHALUS BELLI. N, s.

Fig. 7.

Description.—Head semi-circular, the width apparently twice the length or a little more. Front margin surrounded by a narrow convex rim, distant about its own width from the front of the glabella. The latter is obtusely oblong, conical rather convex well defined all round by the narrow groove of the dorsal furrows, the sides nearly parallel, straight or nearly so, the front rounded. The neck furrow extends entirely across, nearly straight in the middle third and directed obliquely forward at an angle of about 45° at the outer third on each side. In front of this, two oblique glabellar furrows on each side, their inner extremities separated by about one-third the width of the glabella, forming three lobes of nearly equal size. The eyes appear to be situated opposite the second pair of furrows from the front, and to be distant from the glabella about one third the width of the neck segment.

Length of head of medium size, six lines and a half; length of glabella five lines and a half; width of the same at base four lines; a little narrower towards the front; width of marginal rim half a line; width of space between the marginal rim and the front of the glabella, half a line. Surface smooth.

Cheeks, eyes, thorax and pygidium unknown. Dedicated to Mr. Robert Bell, the discoverer of the genus in the Canadian rocks

Limestone, No. 1.

DIKELOCEPHALUS MEGALOPS. N. s.

Fig. 9.

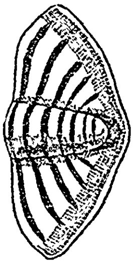


Fig. 9.

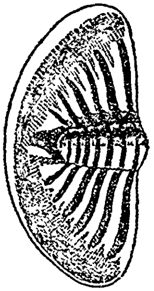


Fig. 11. Fig. 10. Fig. 12.

Fig. 9.—*D. megalops.*
Fig. 10.—*D. cristatus.*
Fig. 11. *and* 12.—*Pygidia* common in Limestone No. 1.

Description.—Head appearently semicircular; anterior margin strengthened by a narrow convex rim a little more than its own width from the front of the glabella, just within which is a curved row of punctures with fine striæ as in *D. Oweni.* Glabella elongate conical, depressed convex, front rounded, sides nearly straight, slightly converging from behind forward. Neck furrow straight in the middle, turned slightly forward towards the ends. In front of this two other short furrows on each side dividing the glabella into three lobes of which the anterior is the largest; the posterior furrows sometimes obscurely connected on the median line their outer extremities directed forwards at an angle of 45° with the longitudinal axis of the body; the anterior pair nearly at right angles but sloping a little forwards, their inner extremities not connected. On the front lobe there appear to be indications of a third pair of furrows on one of the specimens. The eyes are semi-annular, nearly half the whole length of the head, their anterior corners a little in advance of the outer extremities of the anterior glabellar furrow; their centres distant from the sides of the glabella, one third the width of the neck segment, their upper and lower angles, half that distance. Surface except the striated front margin apparently smooth.

Cheeks, thorax and pygidium unknown

Length of largest head seen five lines and a half; of glabella four lines and a half; width of glabella at neck segment three lines and a half nearly and at front furrows three lines.

Limestone, No. 1.

DIKELLOCEPHALUS CRISTATUS. N. S.

Fig. 10.

Description.—Small, head apparently semicircular; front margin with a strong rim abruptly elevated on its posterior edge and thence descending with a flat slope to the anterior edge, distant about its own width from the front of the glabella, with a row of punctures as in *D. Oweni.* Glabella oblong, front and sides somewhat straight, anterior angles rounded, neck segment and furrow well defined, no glabellar furrows. The glabella just in front of the neck furrow is abruptly elevated into a sharp rounded roof-shaped ridge from which it descends with a flat or gently concave slope to the front and lateral margins. Eyes very large, full one half the whole length of the head, their posterior angles close to the glabella at the neck furrow, thence they curve outwards so that their centres are distant from the sides of the glabella rather more than one third the width of the neck segment, thence more gradually curving inwards they reach the sides of the glabella (nearly) at a point a little in advance of its length.

Length of head in largest specimen seen four lines; of glabella about three lines; width of glabella at base two lines, a little narrower in front. Surface with the exception of the striated and punctured front, apparently smooth.

Limestone, No. 1.

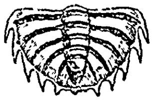


Fig. 13.

Fig. 13.—The pygidium represented by Fig. 13, appears to belong to a species of *Dikelocephalus*, but the small fragment of stone in which it occurs resembles Limestone No. 2, in which no recognisable fragments of that genus have been found.

Genera.—Arionellus (Barrande) and Menocephalus (Owen).

These two genera seem to be closely related and I shall therefore notice them collectively. In *Arionellus* the glabella is cylindrical or sub conical with three or four lateral furrows. The facial suture proceeds from the eye forward with a slight inward inclination to the front margin which it cuts on a line drawn between the eye and the glabella parallel with the axis of the body. Behind the eye it cuts the posterior margin at a point situated on a line drawn between that organ and the outer angle of the head. In the thorax of *A. ceticephalus* there are from 7 to 16 segments according to the age of the individual. The pygidium is small.

The head (all that is known) of *Menocephalus* only differs from *Arionellus* in having the glabella exceedingly convex. Owen discovered the glabella and a portion of the cheek plate but none of the other parts. He describes the former as being circular, highly arched hemispherical and pustulated. Judging from this description and the figure given by the author and also from the aspect of the associated fossils it appears to me highly probable that the species which I have called *M. globosus* is not only congeneric with Owen's *M. minnesotensis* but that it is closely allied thereto. *M. Sedgewicki* cannot be separated generically from

M. globosus and this latter leads us through *A. subclavatus* to *A. cylindricus.*

This latter appears to me to be an *Arionellus.* The specimens are too imperfect to enable me to prove whether or not our four species belong to two distinct genera or one only. I shall place the two most convex forms in *Menocephalus* and the other two in *Arionellus.*

ARIONELLUS CYLINDRICUS. N. S.

Fig. 14.

Fig. 15.

Fig. 14.—*Arionellus cylindricus.*
Fig. 15.—*Arionellus subclavatus: a,* side view of the glabella.

Description.—Glabella sub-cylindrical slightly narrowed from behind forwards, the sides nearly straight and separated from the very prominent cheeks by a deep furrow; the front obtusely rounded or nearly straight. The neck furrow is deep and rounded and the neck segment well defined but apparently not very prominent. The posterior glabellar furrow is well defined all across, parallel with the neck furrow for half the width of the glabella and then directed obliquely forward on each side at an angle of 45°; it is about its own width distant from the neck furrow. The next furrows forward are situated a little in advance of the mid-length of the glabella; they are slightly oblique and their inner extremities are separated by about one third the width of the glabella. In front of these are two other furrows on each side very inconspicuous and not always visible. The anterior margin of the head consists of a narrow elevated ridge separated from the front of the glabella by an angular groove of about its own width. From the summit of the terminal ridge the margin descends with an abrupt slope so that on a front view the head appears to be bounded by a flat nearly vertical band, the width of which is equal to rather more than one half the elevation of the glabella. The surface appears to be smooth or finely granular. Eyes, fixed cheeks, thorax and pygidium unknown. Length of longest head seen three and a half lines; width of glabella about two lines at neck segment and a little less at the anterior extremity. The form of the glabella of this species is almost exactly like that of *Dikelocephalus granulosus.* (Owen). [See Geo. Rep. Wisconsin, Pl. 1, Fig. 7.]

Limestone No. 1, not common.

ARIONELLUS SUBCLAVATUS. N. s.

Fig. 15,—*a.*

Description.—Glabella as long as the head, separated from the front margin by a narrow groove only, strongly convex, and elevated in the anterior two-thirds, less convex, more depressed, and somewhat narrower in the posterior third; sides gently convex, nearly straight, sub-parrallel, slightly more distant from each other towards the front than behind, front obtusely rounded. The neck segment and furrow are rounded and well defined all across; the posterior glabellar furrows are rather strong, directed forwards at an angle somewhat less than 45°, their inner extremities separated by one-third the width of the glabella, and distant from the neck furrow about the width of the neck segment. In front of these are two obscure, nearly vertical furrows on each side, at about equal distances from each other. The fixed cheeks are strongly elevated, and separated from the glabella by the deep, narrow dorsal furrows. The eyes are small, and situated on a line drawn across the head, passing about midway between the two posterior glabellar furrows. They are connected with the front lobes of the glabella, by slender ocular ridges, as in the genus *Conocephalites.* The distance of the eye from the glabella, is a little more than half the width of the neck segment. The facial suture cuts the front margin, a little inside of a line drawn through the eye, parallel with the length of the body. Behind the eye it runs obliquely outward with a gentle curve, and cuts the posterior margin at a point between the line passing through the eye, and the posterior angles of the head. The surface in the large specimens is finely tubercular, but in the small ones apparently smooth. Length of largest head seen five lines and a half; the width of the glabella at one-third the length from the front, is about three-fourths of its own length, excluding the neck segment and furrow. Moveable cheeks, thorax and pygidium unknown.

Limestone No. 1.

MENOCEPHALUS SEDGEWICKI. N. s.

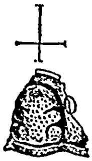


Fig. 16

Fig. 16.—*Menocephalus Sedgewicki.*

Fig. 17. Fig. 18. Fig. 19.

Fig. 17.—Side view of the head of *M. globosus.*
Fig. 18—Upper surface of the head of *M. globosus.*
Fig. 19.—*Menocephalus globosus* front view of the head.

Description.—Glabella very convex, conical gradually tapering from the neck segment to the front, which is obtusely rounded. Neck segment and neck furrow-well defined all across. Two glabellar furrows on each side, which divide the glabella into three pair of lobes, the anterior pairs a little the largest, the other two nearly equal to each other. The posterior furrows sometimes curve so far backwards as to isolate the lobes from the body of the glabella; their depth, however, is inconsiderable. The glabella is separated from the cheeks and front margin, by the deep, narrow dorsal furrow which runs all round. The eyes are situated opposite the anterior glabellar furrows, and distant from the glabella about one-fourth the width of the neck segment. The front margin slopes from the front of the glabella downwards, and is then turned up to form a slightly elevated but well defined wire-like rim, which probably runs all round. Surface covered with small tubercles. Cheeks, thorax and pygidium unknown. Length of largest specimen collected four lines, length of glabella, including neck segment, three lines; width of, at neck furrow, two lines.

In some specimens a third glabellar furrow is represented by an obscure indentation close to the front.

The facial suture is evidently the same as in *A. cylindricus* and*A. subclavatus.*

Limestone No. 1.

MENOCEPHALUS GLOBOSUS. N. S.

Fig. 17, 18, 19.

Description.—Head globose, the posterior angles produced into small slender spines directed outwards, at an angle of about 45°, with the axis of the body. Glabella exceedingly convex, almost hemispherical, its length slightly exceeding its width; either totally destitute of lateral furrows, or with two inconspicuous indentations on each side. Neck furrow and segment well defined; the margin of the head with a narrow, wire-like border all round, which turns up in front of the glabella, and forms an obtusely pointed rostrum; cheeks moderately tumid, but drooping on each side, so as to give a great depth to the outline of the head. Eyes about one-fifth the total length of the head, situated opposite the mid-length of the glabella, and about their own width from it. Facial suture as in *A. subclavatus.* Surface covered with small tubercles. Width of head in the specimen figured five lines; length, three lines; length of glabella, two lines and one-fourth.

Associated with these are very numerous glabellæ of a larger size, in general four lines in length, which probably belong to this species.

Limestone No. 1.

Genus BATHYURUS. Billings.

This genus was described in the "Canadian Naturalist and Geologist," vol. 4, p. 364, in the article on the fossils of the Calciferous Sandrock. It differs from *Asaphus* by having nine segments in the thorax, the front of the hypostoma not forked, and the glabella well defined by the dorsal furrows. It somewhat resembles both *Megalaspis* and *Niobe* (Angelin), in the form of the glabella, but the hypostoma is precisely like that of *Ogygia.* I have some evidence to shew that the head is composed of three pieces only, as in *Dikelocephalus.* The species heretofore described are, *B. amplimarginatus*, *B. conicus*, and *B. Cybele*, from the Calciferous Sandrock:—*B. Angelini*, Chazy:—*B. extans*, (*Asaphus extans*, Hall,) as yet known only in the Black River limestone, and *B. spiniger*, (*Acidaspis spiniger*, Hall.) This latter species occurs both in the Black River and Trenton, in Canada.

The following species are referred to this genus provisionally. I am not at all satisfied that they belong to the genus, but I know of no other to which they bear so near a resemblance.

BATHYURUS CAPAX. N. s.

Fig. 20.

Description.—Head, convex, forming a depressed quarter of a sphere. Glabella oblong, separated from the flat, sloping rim of the front margin by a narrow angular groove; sides gently concave, nearly straight, with a short obscure outward curve opposite the eye, slightly converging towards each other from behind, forwards. The neck furrow is represented by an obscure transverse impression, which occupies the middle third of the width of the glabella, but does not reach all across. The anterior and posterior angles are rounded, and although distinctly defined all round, by the dorsal furrows, (which, however, are only slightly impressed), the glabella in the anterior half, is scarcely at all elevated above the general convexity of the head; it is moderately prominent behind. The eye is situated at mid-length of the head, semi-annular, its centre distant from the side of the glabella, two lines, when the length of the head is thirteen lines.

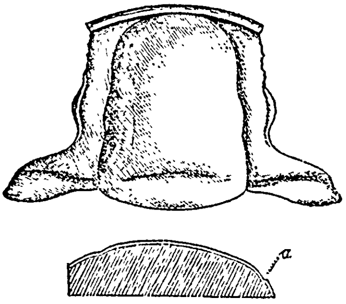


Fig. 20.

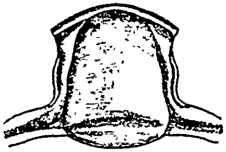


Fig. 21.

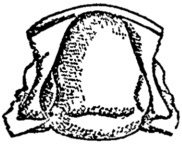


Fig. 22.

Fig. 20.—*Bathyurus capax.* The lower figure is a longitudinal section, shewing the convexity of the glabella and the flat sloping rim of the front margin at *a.*

Fig. 21.—*Bathyurus dubius.*

Fig. 22.—*Bathyurus bituberculatus.*

The anterior margin of the head to front of the glabella is strengthened by a flat rim, which slopes downwards and forwards at an angle of about 60°, with the horizontal plane of the body. This character is constant in heads specimens of all sizes, from a length of six lines to thirteen. The width of this rim in the largest specimens, is one line and one-third. Cheeks, thorax and pygidium, unknown. Surface apparently smooth.

Length of large head, thirteen lines; width of glabella, at base, nine lines, and at two lines from the front margin, eight lines.

Limestone, No. 1.

Bathyurus dubius. N. s.

Fig. 21.

Description.—This species differs from *B. capax* in having the glabella more pointed, and narrowly rounded in front, and the marginal rim not flat but of a sub-cylindrical wire-like form.

Length of head in largest specimen seen, nine lines; width of glabella at neck furrow, six lines and a half, and at two lines from front margin, five lines.

Limestone, No. 1.

Bathyurus bituberculatus. N. s.

Fig. 22.

Description.—Glabella the same as in *B. dubius*, but more pointed in front, and with an elongate-oval tubercle or lobe on each side of the posterior half. These tubercles are of an elongate oval form, pointed at both ends, bounded on the outside by the dorsal furrow which runs all round the glabella, and on the inside by a shallow, rather obscure groove, but which seems to separate them completely from the main body of the glabella. The lower pointed extremity of each, terminates a little below the level of the neck furrow, and the upper, a little behind the mid-length of the head.

Length of largest head seen, eight lines and a half; width of glabella just behind the neck furrow six lines; length of each tubercle two linees and a half; width of same in the middle one line. Surface smooth.

Limestone, No. 1.

Bathyurus armatus. N. s.

Fig. 23.

Description.—Head very convex, with a strong broad-based spine projecting backwards from the neck segment. The contour of the glabella is obscurely indicated by two faint grooves which appear to die out before reaching the front margin. It appears to be regularly conical, but scarcely at all elevated above the general convex surface of the head. Length of head in the specimen figured excluding the marginal rim, which is unknown, nine lines. Width of glabella at base, six lines; at about the middle of the head, five lines; the length of the spine is unknown. Surface smooth.

Limestone, No. 1.

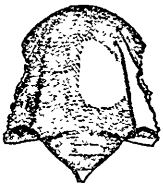


Fig. 23.

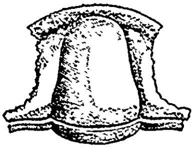


Fig. 24.

Fig. 25.

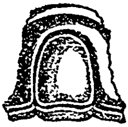


Fig. 26.

Fig. 27.

Fig. 23.—*Bathyurus armatus.*
Fig. 24.—*Bathyurus Saffordi.*
Fig. 25.—*Bathyurus oblongus.*
Fig. 26.—*Bathyurus Cordai.*
Fig. 27.—*Bathyurus quadratus.*

BATHYURUS SAFFORDI. N. S.

Fig. 24.

Description.—Glabella conical convex, much elevated above the general surface of the head, front angles rounded, sides somewhat straight in the anterior half, below which they curve a little outwards, and become paralled for a short distance next the posterior margin. The neck furrow in the cast of the interior is well defined all across, but when the crust is preserved it dies out on approaching the sides. The rim which forms the front margin has a flat slope inwards to the anterior edge of the glabella.

Length of largest head seen, eight lines and a half; width of glabella at neck segment, six lines, and at two lines from the front, three lines and a half. Surface smooth.

Dedicated to Professor J. M. Safford, State Geologist of Tennessee.

In Limestone No. 2.

BATHYURUS OBLONGUS. N. s.

Fig. 25.

Description.—The glabella of this species is oblong, convex with nearly parallel sides, well separated from the cheeks by the deep dorsal furrow, the front rounded, and the neck furrow rather deep all across. The eyes are small, situated a little behind the mid-length of the glabella, and distant from the dorsal groove a little less than one half the width of the neck segment. The marginal rim of the head is the same as in *B. Saffordi.* Surface smooth. Length of glabella four lines; width three lines.

Limestone, No. 2.

BATHYURUS CORDAI. N. s.

Fig. 26.

Description.—Glabella conical, with a deep sulcus all round; in front an elevated rim apparently forming a rostrum similar to that of some species of *Calymene*; just within the rim a deep groove, between which and the furrow that surrounds the glabella, there is a rounded ridge. Neck furrow well defined all across. Eyes apparently about opposite the middle of the glabella. Surface smooth.

The glabella in some of the specimens is more narrowed towards the front than it is in the specimen figured.

Length of largest head seen, seven lines; length of glabella, five lines; width just in front of the neck furrow, three lines and two-thirds; at one line from the front, three lines.

Limestone, No. 2.

BATHYURUS QUADRATUS. N. s.

Fig. 27.

Description.—Glabella oblong, convex, only slightly rounded in front, well defined all round by the dorsal furrows, the sides straight and parallel, the eyes are small, and situated as in *B.*

oblongus, an ocular ridge obscurely visible in one specimen. Neck furrow well defined all across.

Length of glabella four lines; width three lines and a half.

Limestone, No. 2.

CHEIRURUS APOLLO. N. s.

Fig. 28.

Description.—Head convex, semicircular, width about twice the length or a little more. Glabella depressed, convex, somewhat circular or very broadly conical, the posterior margin convex, the sides and front rounded, the width at the posterior third equal to the length, the neck furrow in the cast defined all across three glabellar furrows directed obliquely forwards and outwards at an angle of about 30°, with the longitudinal axis, their inner extremities turned backwards, and distant from each other about one-fourth the whole width. The four side lobes of the glabella

Fig. 28.

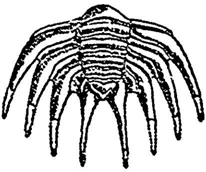


Fig. 29.

Fig. 30.

Fig. 28.—*Cheirurus Apollo.*

Fig. 29.—*Pygidium.* Limestone No. 2. This may be the tail of an *Amphion.*

Fig. 30.—*Cheirurus Eryx.*

are sub-equal, the posterior pair a little larger than the others. Eyes small, opposite the second lobe from behind, distant from it about the width of the lobe or a little less. Cheeks in the cast punctured. I have not ascertained whether or not the posterior angles terminate in spines. Length of head, five lines; length and width of glabella, a little less than five lines.

There are many European species of this type, and they range from the Landeilo Flags upwards to the Devonian.

Limestone, No. 2.

CHEIRURUS ERYX. N. s.

Fig. 30.

Description.—Head semicircular, depressed convex, width twice the length or a little more, the posterior angles [illegible] into short spines. Glabella elongate conical, moderately [illegible] rounded in front, sides nearly straight or gently convex, neck furrow well defined all across, and continued on the cheeks to the outer angles of the head, four lobes on each side of which the anterior is largest, the ,posterior smallest, and the other two almost equal to each other, the furrows directed obliquely forwards at an angle of about 30°, to the longitudinal axis, their inner extremites distant from each other a little less than one-third the width of the glabella. Cheeks moderately convex, punctured. Eye opposite the second lobe from the front, and distant from the glabella apparently about the width of the lobe.

Length of head nearly four lines; of glabella, about three lines and a half; width of glabella two lines and a half.

Limestone, No. 2.

Closely allied to a small species which occurs in the Chazy limestone at Caughnawaga. Another of the same size and type occurs at Phillipsburgh.

ASAPHUS ILLAENOIDES. N. s.

Description.—Head very convex, in shape like that of an *Illaenus*, equal to about one-fourth of a sphere, posterior angles rounded; width a little less than twice the length. Glabella obscurely defined, oblong, slightly narrowed just behind the eyes, thence a little widened both forwards and backwards. Eyes subglobular, of a medium size, close to the glabella, the distance between their centres about equal to the length of the head. The facial suture runs from the inner anterior angle of the eye, with a scarcely perceptible curve outwards, directly forward to the front margin, being in this part almost parallel with the longitudinal axis of the body. From the inner posterior angle it runs outwards and backwards, and cuts the margin at a point in a line drawn parallel with the axis of the body, passing outside of the eye at a distance therefrom equal to one-half the width of that organ. The cheeks from the eye to the posterior angle of the head, descend with a flat slope of about 45° to the horizontal plane of the body. The surface appears to be smooth.

The pygidium is depressed, convex, semicircular, the posterior margin regularly rounded; the axis depressed, semi-cylindrical, sub-conical, sides a little concave rather prominent, the extremity very obtusely rounded, the length varying from a little more than one-half to two-thirds the total length; its width a little less than that of the side lobes, five very obscure segments of which the last two are sometimes blended into one. The anterior margins of the side lobes are almost at right angles to the axis for one-half or thereabouts of the width, then sloping backwards to the outer corners, which they reach at an angle of about 30° to the transverse diameter of the body.

Just behind the margin there is a single groove, obscure towards the axis but more distinct outwards. There are in some specimens, several faintly marked ribs, but in general the side lobes, with the exception of the anterior furrow, are smooth.

Length of head of a specimen of medium size, seven lines width, twelve lines; distance between centres of eyes, seven lines.

Length of a pygidium of medium size, six lines; width, twelve lines; length of axis, four lines and a-half; width of same at front margin, three lines and a half, and at half a line from the posterior extremity, three lines.

I have seen the underside of the head of this species and the sub-rostral fold is distinctly divided as in *A. platycephalus* Had not this character been observed, I would have, without much hesitation, referred the head to the genus *Illænus.*

In Limestone No. 3.

Asaphus Goniurus. N. s.

The above name is proposed for a small triangular pygidium found in No. 3. It is evidently distinct from any described Silurian species of this country, but allied to one that occurs in the Chazy Limestone at Mingan. The form is triangular, the length three-fifths, or thereabouts, of the width, the axis scarcely at all elevated above the surface, and indistinctly divided into segments in the anterior half, but towards the extremity becoming strongly elevated, smooth and pointed. The largest specimen seen is about half an inch in length. It resembles t e tail of a small *Homalonotus.*

Limestone No. 3.

MISCELLANEOUS.

THE OIL WELLS OF MECCA.

by Dr. J. S Newberry.

Within the past week I have made a pilgrimage to Mecca, somewhat to my edification, and now perhaps you would be interrested in a very brief description of this newly found "city of the *profit*."

This modern Mecca is, as you are perhaps aware, situated near the centre of Trumbull county, ten miles north-east of Warren. Till recently—like so many towns on the Reserve, and their prototypes, the farming towns of New England—simply the pleasant and very quiet home of a peaceful and thrifty rural population. In March last, however, the Oil Springs, which had been well known to the inhabitants for fifty years, and from their contaminating influence on the water, regarded as anything but a blessing—attracted the attention of some Pennsylvanians, whose eyes had been opened by the wonders of Oil Creek. These parties leased from the proprietors most of the lands in the vicinity of the springs and wells containing oil. In the face of general incredulity and much ridicule, a well was bored at Powers' Corners by Messrs. Burnell, Jordan & Woods, and a pump set in it some six weeks since. This has continued to discharge three or four barrels of oil daily, from that time to the present, silencing ridicule but producing little excitement.

Many were encouraged to bore on their lots, and two weeks ago to-day the second pump was put in operation. This was owned by two Germans who were quite poor, and who had struggled on, nearly discouraged, until their somewhat rude machinery could be put in motion. With the first stroke of the pump the oil began to flow, as it has done steadily since, at the rate of about twenty-five gallons per hour, or from 12 to 16 barrels per day. The proprietors are raised from their poverty and despondence to a point far above their wildest hopes. After seeing the oil flowing in a copious and steady stream, and the triumphant success of the experiment demonstrated, one of them turned to the crowd, and carried away by his feelings, said, "I tell you now, gentlemen, if a poor man comes and asks me for a thaler, I gifs him a tausend" —a generosity to which his newly found affluence will doubtless prove a complete antidote.

A few days later, one of our citizens, who was there, asked him in mere curiosity if he would sell the well for $15,000, but he was not to be dazzled by any such trifling sum, and said that four times that amount was the least offer worth considering. When it is remembered that his well is daily paying over $150 profit, his valuation will scarcely seem extravagant.

These two are the only wells in which pumps have as yet been placed, but at least fifty others have been bored in their vicinity in which oil has been found in considerable quantity—sometimes more than five barrels having been raised in the sand pump, and saved during the process of sinking the auger fifty feet—a fact which certainly augurs well for the richness of the district.

This oil is dark, thick, tarry looking stuff, very much like that from the Titusville wells, but has almost no unpleasant odour, and has proved on trial to be readily refined, and to be fully equal both as a lubricator and illuminator to the best samples from Pennsylvania. It is perhaps yet too early to make a just comparison between the Mecca and Titusville oil regions, as the former is not yet fully explored, nor has the productiveness or permanance of its oil springs been fairly tested. The quality of the oil is however, not inferior, and the present indications of its quantity are quite as promising as they were on Oil Creek, at a similar period in the developement of the wealth of that region.

In one respect the proprietors of the wells in Mecca have a decided advantage over those of Pennsylvania—in the greater accessibility of their oil. The most copious flow has been found within fifty feet of the surface, and the rock is so easily penetrated that a well may generally be sunk to that depth within a week and at a cost of fifty dollars. To fit it for the reception of a pump something more is necessary, but the entire expense is comparatively trifling.—*Cleaveland Paper.*

REVIEWS AND NOTICES OF BOOKS.

Report of the Geological Survey of Canada for the year 1858.

We should have noticed this Report some time ago, but for a press of other matter; and now we can but give a summary of its contents, referring the reader to the publication itself, which has been very properly placed in the book-stores for sale.

First, we have the continuation of Sir W. E. Logan's exploration of the beds of Laurentian limestone; from which it appears that four important bands of crystalline limestone have now been traced for considerable distances through this contorted and altered series of strata. The aggregate thickness of all these limestones appears to be no less than 4000 feet, and so far no certain indications of fossils have been discovered in them.*

Another portion of Sir William's Report, very valuable at present, is a summary of the latest facts relative to the metalliferous deposits of Canada, and especially the copper deposits of the Eastern Townships. This part of the Report, as well as the tabular view of the localities in the Appendix, should be studied by every one interested in these deposits.

Mr. Murray's portion of the Report, more fully unravels the intricacies of another cupriferous region, that of Georgian Bay. Mr. Richardson describes the relations of the deposits in the peninsula of Gaspé and the neighbouring shores of the St. Lawrence. Mr. Sterry Hunt contributes a series of examinations of the mineral and chemical constituents of the igneous and altered rocks which penetrate the Silurian series in Lower Canada, and form the mountains of Montreal, Belœil, Rougemont, Mount Johnson, &c., with similar observations on the intrusive masses which have pierced the Laurentian rocks of Grenville and Chatham. We have also a series of examinations of the minerals of the altered sediments of the various series, including the gneissose epidotic and chloritoid rocks. His researches on the formation of gypsum and magnesian rocks, commenced in a previous report, are here brought to a close, and put us for the first time in possession of a simple and satisfactory explanation of the origin and formation of these deposits.

In the appendix to the report is a very valuable catalogue of the animals and plants collected by Mr. D'Urban in the counties of Argenteuil and Ottawa. This, and the catalogue of Lepi-

* In a limestone probably of this age from Madoc, the carbonaceous matter present is arranged in a manner which conveys the impression on microscopic examination that it must have formed part of organic tissues, and in slates associated with this limestone we have observed cylindrical perforations resembling the *Scolithus* of the Potsdam sandstone.

doptera in the present number, are the last services Mr. D'Urban is likely to render for the present to Canadian science. He is now on his way to another field at the Cape of Good Hope, we wish we could say soon to return to us.

Mr. Bell contributes a long and useful catalogue of the animals and plants of the Lower St. Lawrence; and he, we are glad to say, is this summer in his old field.

The Zoologist, June, 1860.—*Van Voorst, London.*

We have to thank the editor of this Journal for his kindly regard to our wish for an exchange, and his favourable notice. The *Zoologist* is a popular magazine of Natural History and a Journal for recording facts and anecdotes relating to animals. The present number contains among other matters very interesting notices of the labors of M. Monhet, a collector at work in Siam; papers on the habits of the Aye-aye, on the Fauna of Mull, and on beetles of the family Trichopterygidæ, with a great variety of interesting notices of new discoveries and incidents in Natural History.

SPECIMENS OF MARINE ALGÆ: chiefly from England. Presented to the *Natural History Society* of Montreal. By Dr. Durkee, Boston.

This volume contains a large number of specimens neatly prepared and carefully named. Many of them are from the herbarium of Dr. Harvey of Dublin, than whom there is no higher authority in this department of Botany. The collection affords a ready means for the determination of species to those few students of Natural History in this Province, who take an interest in this humble but exceedingly beautiful and interesting subkingdom,—the sea-weeds. Some fine specimens of the more obscure plants are embraced in this book; many of which are not to be found in ordinary collections. There are some good examples of the less common Fuci; but the largest number pertains to the class of Rhodosperms, Polysephoniæ, and Calithamnia which are finely illustrated. Interspersed among the prevailing English species, we find some plants from Australia, and a few natives of America. Altogether this is a valuable gift by one of the corresponding members of our Society. We trust that it will form the nucleus of a complete collection of this beautiful class of plants. The Lower St. Lawrence is particularly rich in its genera and species of Algæ, and it may be hoped that some careful collector will supplement Dr. Durkee's gift by a corresponding book of our native sea and river flora.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTINS, ISLE JESUS, CANADA EAST, (NINE MILES WEST OF MONTREAL,) FOR THE MONTH OF JUNE, 1860.

Latitude, 45 degrees 32 minutes North. Longitude, 73 degrees 36 minutes West. Height above the level of the Sea, 118 feet.

BY CHARLES SMALLWOOD, M.D., LL.D.

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.
1	29.571	29.603	29.722	58.5	67.1	86.1	.423	.373	.279	.88	.54	.84
2	758	580	609	44.9	76.7	58.9	.211	.470	.358	.72	.52	.73
3	679	523	528	54.6	79.6	69.4	.328	.501	.430	.77	.51	.61
4	420	301	281	64.1	84.7	69.4	.373	.476	.430	.62	.42	.61
5	242	271	406	66.4	69.2	63.2	.451	.402	.478	.78	.65	.83
6	468	396	438	60.0	79.2	67.0	.456	.405	.463	.88	.47	.71
7	399	304	312	62.9	78.9	63.0	.379	.507	.478	.66	.52	.83
8	322	314	384	59.0	68.6	89.1	.410	.457	.410	.82	.69	.82
9	419	417	471	55.0	69.9	57.0	.370	.456	.359	.84	.63	.73
10	499	537	624	53.1	89.5	56.6	.321	.433	.357	.80	.85	.79
11	641	628	724	54.1	73.5	62.4	.335	.338	.453	.80	.41	.80
12	752	854	783	50.4	80.1	65.4	.265	.567	.509	.75	.57	.81
13	870	748	800	62.0	90.9	71.0	.489	.744	.442	.75	.52	.59
14	801	763	770	69.0	91.0	71.0	.496	.536	.503	.70	.37	.66
15	730	700	707	65.4	85.0	84.2	.483	.577	.897	.78	.49	.53
16	814	824	906	63.0	82.1	65.6	.422	.610	.542	.75	.58	.87
17	884	914	986	64.0	89.4	61.2	.483	.894	.464	.73	.64	.77
18	886	738	728	70.0	84.5	71.0	.586	.584	.572	.80	.50	.66
19	604	601	614	66.0	78.4	59.1	.542	.664	.439	.87	.69	.88
20	894	614	717	58.2	52.1	54.2	.446	.460	.390	.90	.85	.93
21	914	924	941	52.7	72.9	60.1	.328	.390	.367	.83	.50	.71
22	974	957	914	62.0	82.6	65.0	.406	.604	.490	.74	.54	.81
23	904	900	30.000	61.5	77.2	63.0	.449	.587	.517	.85	.63	.91
24	30.114	30.101	104	64.1	85.5	66.1	.464	.570	.502	.77	.47	.78
25	059	004	29.930	66.3	83.0	72.1	.536	.558	.631	.84	.50	.81
26	29.847	29.899	897	69.3	79.7	68.6	.635	.606	.483	.80	.60	.78
27	30.021	940	501	60.3	79.7	61.6	.426	.644	.390	.82	.64	.74
28	29.807	745	543	64.2	72.8	71.1	.464	.355	.572	.77	.32	.76
29	470	367	538	76.3	77.0	72.1	.652	.799	.771	.73	.86	.95
30	550	597	754	70.2	78.4	65.0	.628	.342	.307	.88	.36	.51
...	......	......	......	......	......	......	......	......	......	......	......	......

Day of Month.	Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE. Mean amount of, in inches.	RAIN. Amount of, in inches.	SNOW. Amount of, in inches.	WEATHER, CLOUDS, REMARKS, &c. &c. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.					6 a. m.	2 p. m.	10 p. m.
1	N.	N. E. by N.	E. by N.	153.50	2.0	....	....	Cu. Str. 8.	Cu. Str. 4.	C. C. Str. 8.
2	S. E.	S. S. W.	E. by E.	10.88	2.0	....	....	Fog.	Cum. 2.	Clear.
3	E. S. E.	S. ty E.	S. by E.	62.80	1.0	....	....	Heavy Dew Clear.	Clear.	"
4	S. by E.	S. S. E.	S. S. E.	114.10	1.0	....	....	" " "	Hazy.	"
5	S. E. by E.	S. S. E.	S. by E.	191.50	2.0	....	....	C. C. Str. 9	C. C. Str. 10.	Cu. Str. 10.
6	N. E. by E.	N. E. by E.	N. E. by E.	62.80	2.5	....	....	Clear.	Clear.	Clear.
7	N. E. by E.	N. E. by E.	W. by S.	126.60	2.0	....	....	"	"	Nim. 10.
8	S. S. W.	S. by W.	S.	245.70	2.0	0.562	....	Cu. Str. 10.	St. 2.	Clear.
9	S. by W.	W. by N.	N. W.	119.90	1.5	....	....	" 10.	Cu. Str. 4.	Cu. Str. 9.
10	N. W.	N. W.	N. by W.	124.60	4.0	Inapp,	....	" 4.	Nimb. 10.	" 8.
11	N. by W.	N. by E.	N.	134.10	1.0	....	....	Clear.	Clear.	Clear.
12	E. by S.	S.	E. S: E.	15.10	1.5	....	....	"	"	"
13	E. by S.	S. E. by E.	S. E.	122.20	2.5	....	....	"	"	"
14	S. W. by S.	S. W.	S. W. by E.	37.00	1.0	....	....	"	" Solar Halo.	C. Str. 2.
15	S. S. W.	S. W.	W. S. W.	10.50	1.5	....	....	"	Cir. 4. Solar Halo.	C. C. Str. 4. distant lightning.
16	S. E.	N. E. by E.	N. E. by E.	84.90	2.5	Inapp.	....	Cu. Str. 4.	Cu. Str. 4.	" " "
17	N. E. by E.	S. E. by S.	S. E. by E.	105.10	2.5	....	....	Clear.	C. C. Str. 2.	Cu. St. 2.
18	S. E.	S. E.	S. E. by E.	28.70	2.0	....	....	"	Cu. Str. 4.	" 8.
19	S. E. by E.	S. S. E.	N. E.	0.50	2.0	0.403	....	"	C. Str. 2. dist. thunder	" 10.
20	N. N. E.	N. E. by E.	N. E. by E.	249.90	3.0	0.271	....	Cu. Str. 10.	" 10.	Rain.
21	N. E. by E.	N. N. E.	S. E. by E.	157.10	3.5	0.600	....	" 8.	Clear.	Clear.
22	S. S. E.	N. N. E.	N. W. by W.	33.10	2.0	....	....	Clear.	C. C. Str. 4.	"
23	W. S. W.	E. S. E.	S. W. by W.	28.60	1.5	Inapp.	....	C. C. Str. 10.	C. Str. 10. dist. lt'ing.	Cu. St. 2.
24	S. S. E.	S. S. W.	S. S. W.	13.80	1.5	....	....	Clear.	Clear.	" 4. comet visible.
25	S. S. W.	W. S. W.	W. S. W.	80.60	1.5	....	....	"	"	Clear.
26	W. S. W.	W. S. W.	N. by W.	76.35	3.0	0.597	....	Cu. Str. 10.	C. C. Str. 4.	Cu. St. 10.
27	N. E.	W.	W. S. W.	89.60	1.5	....	....	Clear.	Clear.	" 4.
28	S. W.	W. S. W.	S. S. W.	108.10	1.9	Inapp.	....	"	Cu. Str. 4.	C. C. Str. 4.
29	S. W. by S.	W. by N.	S. S. W.	149.90	3.5	0.116	....	Cu. Str. 4.	" 10.	" 4.
30	S. W.	W. by S.	W. N. W.	158.30	2.0	....	....	Clear.	Clear.	Cu. St. 8.
...	......	......	......	....	......			....	....	....

REPORT FOR THE MONTH OF JULY, 1860.

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a.m.	2 p. m.	10 p. m.
1	29.867	29.817	29.866	61.0	74.1	60.6	.325	.568	.338	.61	.67	.65
2	899	822	841	52.6	81.6	63.2	.354	.638	.386	.90	.83	.67
3	794	693	635	65.0	86.3	71.0	.389	.448	.592	.63	.36	.76
4	697	712	687	61.1	76.1	59.0	.413	.273	.317	.77	.30	.62
5	619	675	797	57.2	75.9	58.2	.322	.477	.394	.69	.54	.82
6	895	814	876	65.1	83.2	62.7	.366	.376	.416	.60	.33	.72
7	885	849	818	67.0	85.8	66.0	.489	.487	.431	.75	.40	.66
8	751	644	521	58.6	81.6	66.9	.423	.362	.496	.88	.34	.77
9	396	353	531	69.8	77.6	67.7	.665	.608	.556	.92	.67	.84
10	882	741	742	57.0	64.1	57.0	.350	.464	.429	.75	.77	.91
11	862	830	872	52.1	68.9	57.8	.308	.313	.282	.79	.45	.88
12	940	917	944	56.0	77.1	63.7	.370	.422	.471	.84	.46	.81
13	987	870	900	64.1	82.3	69.1	.376	.425	.496	.89	.39	.70
14	849	838	832	67.5	87.9	70.1	.489	.543	.482	.75	.42	.66
15	816	735	770	66.9	89.0	73.5	.438	.569	.525	.68	.42	.61
16	776	517	604	68.6	84.2	62.0	.809	.545	.586	.81	.47	.92
17	832	827	914	60.0	72.9	65.0	.338	.383	.458	.65	.48	.75
18	821	784	690	62.3	84.2	69.2	.399	.470	.503	.72	.40	.66
19	688	594	680	70.2	88.4	74.6	.621	.650	.497	.85	.49	.59
20	826	809	602	64.7	81.0	68.9	.458	.510	.536	.75	.48	.77
21	419	371	572	63.4	67.9	55.0	.536	.584	.328	.92	.87	.77
22	748	777	676	50.9	71.4	60.3	.302	.503	.345	.82	.66	.68
23	421	323	652	61.0	68.6	44.9	.413	.443	.275	.77	.65	.92
24	612	566	739	51.0	64.2	55.8	.296	.403	.365	.79	.68	.76
25	861	824	856	51.3	78.0	62.9	.321	.514	.429	.86	.54	.77
26	508	614	703	63.1	71.3	64.0	.517	.403	.536	.81	.54	.92
27	878	840	30.007	53.7	68.2	56.6	.223	.232	.336	.64	.34	.75
28	991	967	29.976	47.5	74.2	63.0	.291	.568	.388	.89	.67	.69
29	779	665	612	65.6	70.0	59.1	.483	.483	.477	.78	.66	.95
30	626	601	698	64.2	80.3	62.4	.461	.599	.399	.77	.59	.72
31	701	608	744	56.6	72.1	58.3	.413	.524	.328	.90	.66	.77

Day of Month.	Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE. Mean amount of	RAIN. Amonnt of, in inches.	SNOW. Amount of, in inches.	WEATHER, CLOUDS, REMARKS, &c. &c. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.					6 a. m.	2. p. m.	10 p. m.
1	S. W.	W. by N.	W. by S.	34.64	1.0	....	....	Clear.	Cir. 4.	Clear.
2	W. S. W.	N.W. by W.	S. by W.	22.20	1.5	....	....	"	"	Cu. Str. 4.
3	S. by W.	S. W.	S. by W.	252.60	1.0	....	....	"	C. C. Str. 8	Cirr. Str. 8. Comet seen.
4	E. S. E.	E. S. E.	S. S. E.	83.40	1.0	....	....	"	Clear.	C. C. Str. 10. Hazy.
5	N. E. by E.	S. E. by S.	W. S. W.	20.00	1.0	....	....	Cu. Str. 10.	C. C. Str. 4.	Str. 2.
6	S. E. by S.	E. S. E.	S. E.	97.00	1.5	....	....	Clear.	Clear.	Clear.
7	S. E.	S. S. W.	S. S. E.	45.00	1.5	....	....	"	" Thunder.	Cirr. 4.
8	S. S. E.	S. S. E.	S. by E.	169.60	2.0	....	....	" heavy dew.	"	Cu. Str. 6.
9	S. S. E.	S. W.	W. S. W.	231.20	3.0	0.330	....	Rain.	Cu. Str. 10.	" 8.
10	S. W. by W.	W. by N.	W. by S.	224.70	3.0	....	....	Cu. Str. 8.	C. C. Str. 10.	" 2.
11	W. N. W.	N. W.	N. N. W.	233.60	1.5	....	....	Heavy dew, clear.	Cu. Str. 2.	" 8.
12	N. W. by N.	S. W,	W.	45.80	1.5	....	....	Clear.	Clear.	" 2.
13	S. S. W.	N. by W.	W. S. W.	38.04	2.0	....	....	"	Str. 4.	Clear.
14	W. S. W.	S. W.	S. S. W.	96.10	2.0	....	....	"	Cirr. St. 4.	"
15	S. W.	S. W.	S. W.	65.60	2.0	....	....	C. C. Str. 4.	Clear.	Cu. Str. 9.
16	S. W.	W. S. W.	W. N. W.	79.50	1.5	1.880	....	Cu. Str. 4.	Cu. Str. 6.	" 9. thunder.
17	W. N. W.	W. by N.	W. by N.	125.90	3.5	....	....	Clear.	C. C. Str. 4.	Clear.
18	S. S. W.	S. S. W.	S. W.	53.20	2.0	....	....	C. C. Str. 6.	Clear.	" Aurora Borealis.
19	S. W.	W. by S.	S. S. W.	17.90	2.0	....	....	Cu. Str. 8.	C. C. Str. 8,	Cu. Str. 6. Distant Lightn'g.
20	S. S. W.	W. by S.	S. W.	78.80	2.5	....	....	Clear.	Clear.	" 4.
21	S. S. W.	W.	W. by W.	50.30	3.0	0.440	....	Rain.	C. Str. 4.	" 8.
22	W. N. W.	W. by N.	W. by N.	220.40	1.5	....	....	Clear.	Clear.	" 9.
23	S. by W.	W. by N.	W.	232.20	2.0	1.055	....	C. C. Str. 6.	Cu. Str. 6.	Clear. Aurora Borealis.
24	S. W.	S. W.	S. W.	151.70	3.0	1.250	....	Clear.	" 8.	"
25	S. W.	S. W.	S. S. W.	31.20	2.0	....	....	Fog.	" 4.	Clear.
26	S. S. E.	S. S. W.	S. S. W.	90.40	2.5	0.706	....	Cu. Str. 4.	Nim. 10.	Cu. Str. 10. thunder.
27	N. by W.	N. N. E.	N. by W.	125.40	1.5	....	....	Clear.	C. C. Str. 6.	" 2.
28	W.	S. W.	S. W.	18.30	1.0	....	....	" heavy dew.	Clear.	Clear.
29	S. S. W.	S. S. E.	S. S. E.	99.90	2.0	Inapp.	....	Cu. Str. 8.	Cu. Str. 10.	Nim. 10.
30	W. S. W.	S. S. W.	W.	78.80	1.0	....	....	Clear.	" 4.	Clear.
31	S. S. W.	W. S. W.	W.	131.10	3.0	0.071	....	Cu. Str. 8.	" 10.	Cu. St. 6.

REMARKS FOR JUNE, 1860.

Barometer ...... Highest, the 24th day, 30·114 inches.
Lowest, the 4th day, 29.231 "
Monthly Mean, 29.682 "
" Range, 0.883

Thermometer ... Highest, the 14th day, 91°0.
Lowest, the 12th day, 44°8.
Monthly Mean, 68°15.
Monthly Range, 46°2.

Greatest intensity of the Sun's rays, 101°2.
Lowest point of Terrestrial radiation, 34°6.
Mean of Humidity, .715.
Amount of Evaporation, 3.72 inches.

Rain fell on 10 days, amounting to 2.849 inches; it was raining 18 hours and 15 minutes, and was accompanied by thunder on one day.
Most prevalent wind, the S. E. by E.
Least prevalent wind, the N.
Most windy day, the 20th day; mean miles per hour, 10.41.
Least windy day, the 19th day; mean miles per hour, Inapp.
Aurora Borealis visible on 1 night.
Solar Halo visible on 2 days.
The Electrical state of the Atmosphere indicated moderate and constant tension.
Ozone was present in moderate quantity.

REMARKS FOR JULY, 1860.

Barometer. ...... Highest, the 27th day, 30.007 inches.
Lowest, the 23rd day, 29.323 "
Monthly Mean, 29.733 "
Monthly Range, 0.684

Thermometer. Highest, the 14th day, 89°1.
Lowest, the 22nd day, 43°8.
Monthly Mean, 66°47.
Monthly Range, 45°3.

Greatest intensity of the Sun's rays, 100°3.
Lowest point of terrestrial radiation, 37°1.
Mean of humidity, .679.
Amount of Evaporation, 3·78 inches.

Rain fell on 8 days, amounting to 5.732 inches; it was raining 25 hours 15 minutes, and was accompanied by thunder on two days.
Most prevalent wind, the S. S. W.
Least prevalent wind, the N. by W.
Most windy day, the 3rd day; mean miles per hour, 15.52.
Least windy day, the 5th day; mean miles per hour 0.83.
Aurora Borealis visible on 3 nights.
Meteor in N. W. at 8.30 p. m. 21st day.
The Electrical state of the Atmosphere has indicated constant and moderate intensity.
Ozone was in moderate quantity.
Eclipse of the Sun visible on the 18 day.