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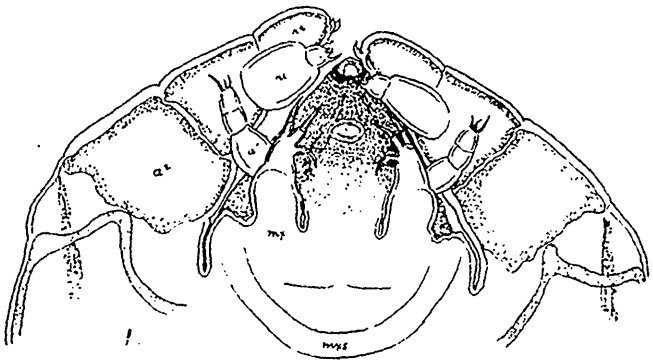

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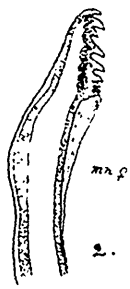

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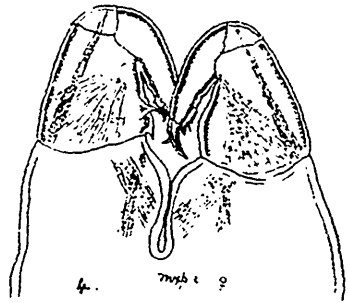

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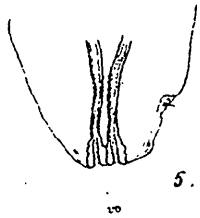

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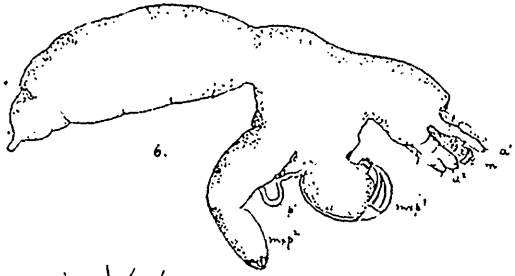

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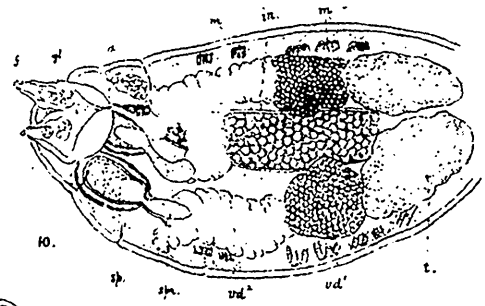

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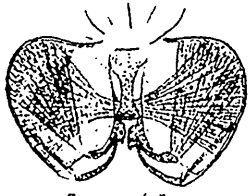
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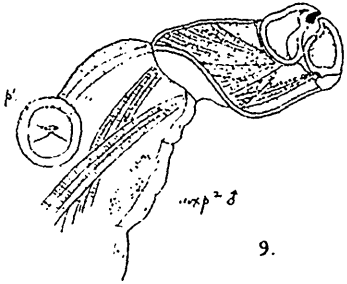

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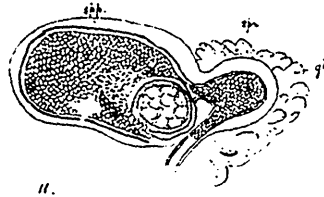

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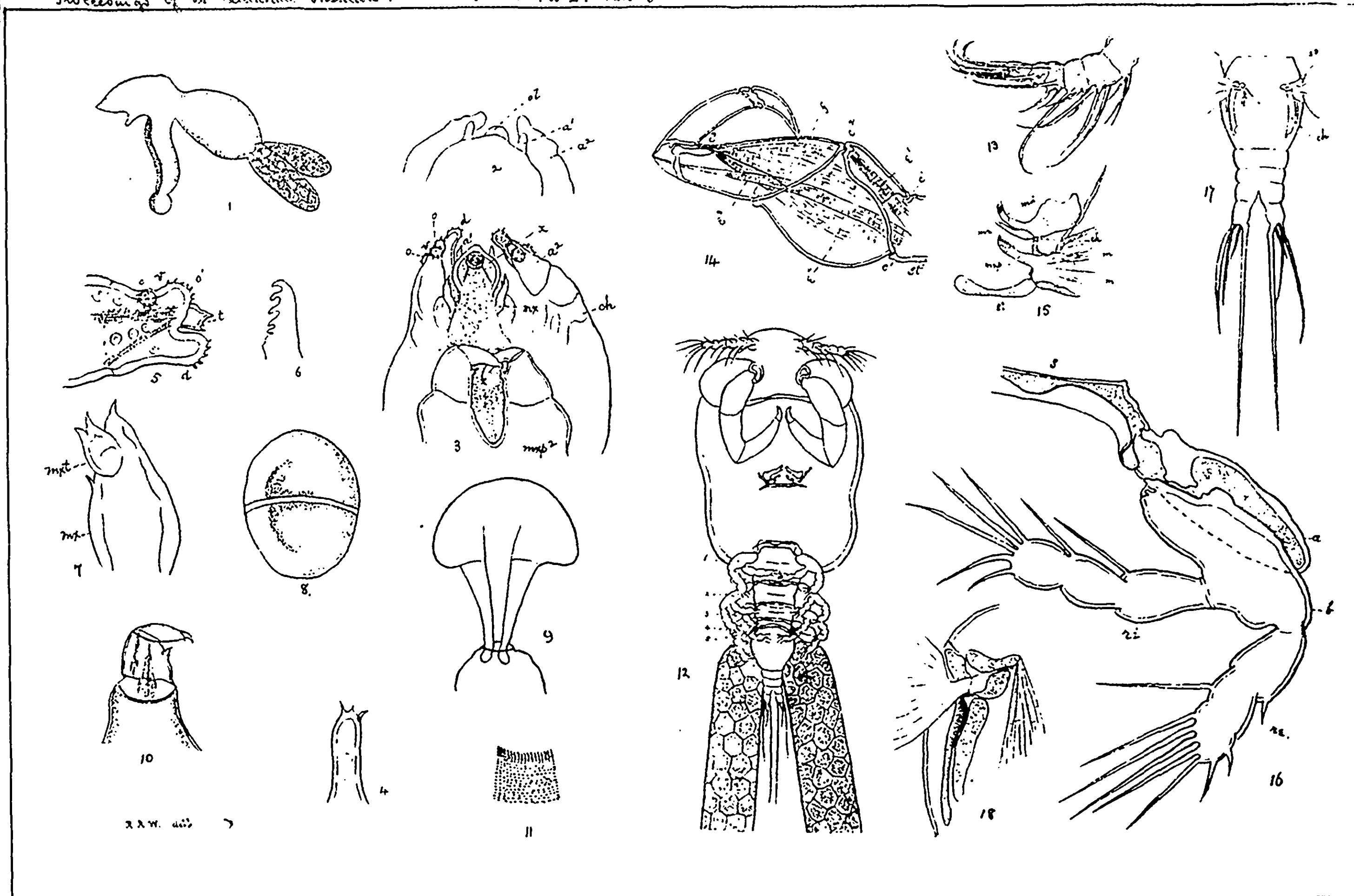
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NOTES ON

AMERICAN PARASITIC COPEPODA.

No. I.

BY R. RAMSAY WRIGHT, M.A., B.Sc.

Professor in University College, Toronto.

In the course of some helminthological investigations concerning the Fresh-Water Fishes of this region, the results of which I hope to publish shortly, my attention has occasionally been attracted to Parasitic Copepoda, the careful examination of which I have hitherto been obliged to defer. The present paper has for its object the consideration of three of these forms.

I.

ERGASILUS CENTRARCHIDARUM, *n. sp.*

The gills of various members of the family Centrarchidæ are found in this neighbourhood to be infested by a small species of Ergasilus, which usually occurs abundantly on infected individuals. I have observed that the same parasite may also occur on the Perch, but it is much more commonly met with on the Rock Bass (*Amblo-plites rupestris*), the common Sun-Fish (*Eupomotis aureus*, Gill and Jordan), and the Long-Eared Pond-Fish (*Lepomis auritus* [L.] Raf.), especially on the first of the three. I have only met with female specimens.

CHARACTERS.

Length of body, exclusive of furcal bristles, ½ mm., of egg-sacs 1 mm. Cephalothorax nearly as broad as long. Median constriction barely noticeable. The longest of the antennulary bristles as long as the antennule. Mandible without palp. Basal joint of natatory limbs naked. Ramus internus of 1st pair, with single bristle on inner border of 1st and 2nd joints, and 5 terminal bristles: of succeeding pairs, with 2 bristles on the 2nd joint. Ramus externus of 1st pair with 1 spine on outer border of 1st, 2 on outer border of 3rd, and a bristle on inner border of 2nd joints: of succeeding

pairs, without the 2 spines on 3rd joint. Furcal bristles 4,—3 principal, 2 subsidiary, of which one very short.

THE APPENDAGES.—ANTENNULÆ.

One of these is represented in Fig. 13, from the posterior aspect.

They are 6-jointed, and originate on the under side of the head at some little distance from each other. There is no antennulary sternum. Of the joints the 2nd is the largest, and with its exception, the 6th the longest. All the joints bear simple bristles, the longest of which are nearly as long as the antennule itself. The bristles of the first four joints are chiefly directed downwards; of the two terminal joints backwards and outwards. Into each bristle branches of the antennulary nerve may be seen to pass.

ANTENNÆ.

As in the other species of the genus, the antennæ form strong prehensile claws by which the animal clings on to the gill-filaments of its host. The antennary sternum is well developed (Figs. 12 and 14, st.), and enters at its extremities into the construction of the hinge-joints, which the antennæ form with their sockets. The basal joint is much inflated (as in *E. gibbus* V. Nordmann) on its outer and lower aspect, while on the opposite it is strengthened by 2 chitinous ledges, which descend from the hinge between it and the succeeding joint (c^2, Fig. 14) to the socket (c^1). When viewed from the surface one of these ledges gives the appearance of a diagonal division in the basal joint.[1] The hinge between the 2nd and third joints is somewhat complicated, but its arrangement, as well as those of the chief flexor and extensor muscles entering the appendage, may be studied in Fig. 14. The terminal joint is particularly short and curved; in this respect unlike the same part in E. Sieboldii.[2]

APPENDAGES OF THE MOUTH.

These have been only satisfactorily described for *E. Sieboldii* by Claus.

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[1] Vide Olsson, Ofversigt af Kongl. Vet. Akad. Förhand, 1877, No. 5, p. 76.

[2] v. Claus Zeit. Wiss. Zool., Tal. XXIII., Fig. 14. In a revision of the species of Ergasilus, it will probably be found that apart from the size, form of body, and length of egg-sacs, the form of the appendages will afford valuable specific characters. As far as I am aware, however, Claus' figures are the only ones which possess the necessary accuracy of detail.

The parts are somewhat difficult to study in the present species on account of its small size, but the main facts elucidated by Claus are found to obtain also here. I have not detected any labrum. The basal joint of the mandible is very large, and works in a somewhat oval socket from which a chitinous ledge is continued forwards and outwards. The cutting edge is provided with several strong bristles. No palp is to be seen. The maxilla (mx., Fig. 15) is, however, more intimately attached to the mandible than in *E. Sieboldii*. That it is the maxilla, and not a mandibular palp, is shown by its articulation to a chitinous ledge continued forward from the socket of the maxillipede, and on which the basal joint of the mandible also partly rests.

The second maxillipede is absent: the first 2-jointed and armed on the anterior and inferior faces of the lower joint with short, stout bristles. The maxillipedary sternum is particularly strong.

THE NATATORY FEET.

Except in details, which I have found to be constant, and which ought to be looked to for specific characters, the present species agrees with *E. Sieboldii*. The five sterna belonging to the five thoracic somites are constructed on the same type, and are formed of 2 transverse chitinous thickenings continuous with each other at the sockets of the limbs. The sockets (*a* Fig. 16) project more or less from the surface of the body, and enter into the formation of a very free hinge-joint, with the basal segments of the limbs. These are also movably articulated to the posterior of the two sternal thickenings. The figure shows how the bristles and spines are disposed in the external and internal rami of the 1st natatory limb. The internal rami of the 2nd, 3rd and 4th pairs differ from that of the 1st in having two bristles on the second segment instead of one, while the external rami of the 2nd, 3rd and 4th pairs differ from that of the 1st in the absence of the 2 spines on the terminal segment. The basal joint is not ciliated as in *E. Sieboldii*. The natatory limbs of the fifth pair are represented by a bristle articulated to the end of the comparatively well developed sternum.

I have not been able to determine the precise function of the curious chitinous structures situated at the opening of the oviduct, and which Claus has figured much more accurately than previous authors. They are evidently developed from the lining membrane

of the terminal portion of the oviduct. Three or four short chitinous pieces situated above the opening, and connected with each other, I at first supposed to be a coiled tube similar to that described as passing in various free forms from the receptaculum seminis to the end of the oviduct.' But there is no trace of a receptaculum seminis in Ergasilus, and these chitinous pieces serve to form a hinge for the two longer pieces which stretch back within the segment on each side. (Fig. 18). The muscle attached to the shorter chitinous pieces may serve to abduct the egg sacs.

The furcal bristles are differently disposed from any described species of Ergasilus. I am not confident that the arrangement represented in Fig. 7 is constant, but it seems fairly common. Some variability must be assigned to these structures, as Olsson (loc. cit.) has noticed the occurrence of three in *E. Sieboldii*, and I have observed the internal (stronger) bristle bifurcated on one or two occasions.

The egg-sacs, although often unequal, are generally twice the length of the body of the female.

II.

LERNÆOPODA EDWARDSII. *Olsson.*

(Prodromus faunæ Copepodorum parasitantium Scandinaviæ. Act. Univ. Lund., 1868, p. 36.)

Prof. Osler, Montreal, obtained several specimens of a species of *Lernæopoda* from the gills of the brook trout (Salmo fontinalis), which differs markedly from the *S. Salmonea* of Baird, but agrees very well with Milne-Edwards' figure of *Basanistes Salmonea* from *Salmo umbla* (Hist. Nat. d. Crust., Tab. XLI., f. 3). In the above-cited memoir, Olsson proposes the specific name of *L. Edwardsii* for Milne-Edwards' form, and describes its characteristic features from specimens (from unknown host) in the Museum of the University of Lund. It can hardly be doubted that, at any rate, this species of *Basanistes* is a true *Lernæopoda*.[2]

[1] Ang. Gruber, Zeit. Wiss. Zool. XXXII., p. 407 seq.

[2] Apart from the rounded tubercles on the abdomen of B. huchonis, the shortness and thickness of the "arms," and their separate attachment to the chitinous bulla, are regarded as characteristic of the genus; but the different species of Lernæopoda vary much in this respect. In the form described in the text it is easy to prepare the bulla into the halves belonging to each arm.

In size my specimens agree best with *L. Edwardsii* and *L. alpina* Olsson, but the details furnished of the latter[1] forbid their reference to this species, while on the whole they agree very well with Olsson's description of the former. This is, however, not accompanied by details of the appendages, and as Kurz observes[2] it is to these, and not to the form of the body or the angle which the "arms" make with it, that we must look for constant characters on which to ground valid species. I prefer, therefore, to describe the appendages of the present form under the above specific name, rather than attribute too much importance to the difference in shape of the chitinous bulla in Olsson's description.

The shape of the body is sufficiently indicated by the outline sketch, Fig. 1, which also indicates the hump on the cephalothorax, opposite the origin of the arms. The length of the body, exclusive of egg-sacs, is 4 mm., of the egg-sacs 2 mm. (they are probably somewhat more shrunken in proportion by their preservation in alcohol than the body), while the arms are about $2\frac{1}{2}$ mm. long. The position of the 1st and 2nd pairs of antennæ, and of the projecting upper lip, in relation to the anterior border of the cephalothorax, may be seen from the outline sketch from above, Fig. 2. The 1st pair of antennæ are much more easily studied from above than from below, owing to the lateral projections from the upper lip, *x*, Fig. 3, which nearly conceal them from that aspect. They measure 0.07 mm. in length, are indistinctly 3-jointed, and bear on the rounded end of the terminal joint 3 minute spines, of which the median one is distinctly articulated to the antenna, *v*, Fig. 3. The second pair of antennæ may be most conveniently examined from below and from the side. They consist of a thick stem indistinctly 3-jointed, the basal joint being far the longest, and alone provided with a chitinous plate (*ch*, Fig. 3), and of two short branches, dorsal and ventral (*d* and *v*, Figs. 3 and 5), of which the dorsal is the longer and more internal of the two. It is composed of one joint, the rounded extremity of which is provided with numerous curved chitinous points for the most part directed inwards. The ventral and more internal branch has two joints, of which the terminal one (*t*, Fig. 5) is more palp-like than the other parts of the antenna,

[1] Ofversigt af K. Vetensk. Akad. Förhand, 1877, No 5, p. 82, Figs. 9-13.

[2] Studien über die Familie der Lernæopodiden, Zeit. f. Wiss. Zool., B. XXIX., p. 382.

while the basal one bears two discoidal chitinous outgrowths, armed with curved points, of which one is lateral, while the other is ventral, in position (*o* and *o*^{1}, Figs. 3 and 5).

The mandibles (Fig. 6) are 0.1 mm. in length, of which one-third belongs to the toothed portion. This differs from any of the mandibles figured by Kurz in the absence of secondary teeth.

The maxillæ (Fig. 7) are tri-articulate, the basal joint inflated on its lateral aspect, and the terminal joint ending in an outwardly-directed curved spine. The palp originates from the distal part of the second joint above a spine, and itself terminates in two sharp points. The maxillæ measure 0.095 mm. in length, of which one-half is occupied by the basal joints.

The maxillipedes of the first pair, as in the other members of the genus, originate behind the second pair, and are independent as far as their attachment to the bulla. This is best described as mushroom-shaped, and its bilateral character is as well indicated by a surface view (after the fragments of gill have been removed from it), (Fig. 8), as by the fact that it is easy to prepare separately the halves belonging to each maxillipede (Fig. 9).

The maxillipedes of the second pair measure 0.73 mm. in length, and present the typical characters described by Kurz for these appendages in other Lernæopodidæ. Their specific characters may be studied in Figs. 3 and 10.

Fig. 11 reproduces the punctated appearance presented by the border of the lower lip, which measures 0.03 mm. from its attached to its free margin; the latter has only a very narrow fringe.

On comparing Olsson's figures of *L. alpinus* with mine, it is apparent that the bulla presents considerable resemblance; the 2nd antennæ also bear a similar spiny excrescence, but have a pointed instead of a blunt ventral branch; while two chitinous appendages project between the maxillæ from the ledge uniting their basal joints. If the figure of the 2nd maxillipede is accurate, it also differs considerably in outline. The details of Milne-Edward's figure of *Basanistes salmonea* are insufficient for comparison, but the resemblance of the 2nd antennæ and the 2nd maxillipedes (3*c*, 3*a*, Pl. XLI. loc. cit.) is sufficiently striking to justify the conclusion that the form found on the European *S. umbla* and on our Brook Trout are

Loc. cit., Taf. V., Figs. 10, 11, 12, 13.

identical; a conclusion which is rendered more probable by the fact that the hosts both belong to the subgeneric group of the Charrs.

ACHTHERES MICROPTERI, *n. s.*

The specimens for which I have selected the above specific name were found in considerable numbers, both male and female, in the mouth cavity and on the gill-arches of the small-mouthed Black Bass *Micropterus salmoides* [(Lac.) Gill]. As far as the size of the female is concerned, and the character of its fixation in the mucous membrane of its host, it might well be referred to *A. percarum* V. Nord.; but the relatively larger size of the male, the constant downward direction of the arms, the shape of the bulla, some details of structure in the other appendages, and the cylindrical form of the egg-sacs, point to the specific distinctness of this form. I am assured by Prof. D. S. Kellicott that it is also distinct from his *A. Amblopliytis* from the mouth of the Rock Bass; otherwise I should have been inclined to suspect the identity of the two American forms. I have never met with any Achtheres in our common Perch.

The female measures on an average 4 to 4½ mm., the cylindrical egg-sacs 2½ mm. Fig. 1 represents the appendages of the head from the ventral aspect. The antennulæ are attached at some considerable distance behind the mouth: their basal joints are the longest and stoutest of the three. The internal rami of the antennæ seem to present little difference from *A. percarum*, but the ends of the external rami are furnished with toothed sickle-shaped spines.

The mandibles, Fig. 2, have 9 teeth, of which the third is the shortest of the first six, and the last three are successively smaller. The inner edges of the mandibles are sharpened into a knife-edge, which is broadest immediately behind the teeth.

The maxillæ are two-jointed—the distal joint bearing a lateral two-jointed bristle-like palp, and two terminal rami of the same character. The maxillary sternum forms a prominent fold (*mxs.*, Fig. 1), owing to the advance of its appendages in front of the attachment of the antennæ.

The internal maxillipedes are three-jointed: the basal joints are united, the second are stout and furnished with a hook on the inner side (vide left side of Fig. 4), while the third are armed with a strong terminal curved claw articulated to the joint, which on its inner aspect is further furnished with two trenchant serrated ridges.

Of the muscles which move the terminal joint, the flexors are by far the most powerful; whence the ordinary position of these joints.

The arms in length (1½ mm.), transverse wrinkles, &c., resemble those of *A. percarum*, but instead of lying in front of the head have a downward direction as in Lernæopoda. Unlike this genus there is no *continuously* chitinized bulla, and the separation of the plate which represents it from the mucous membrane is much more difficult than in that form. The plate is somewhat hollowed out on its distal surface (cup-shaped in *A. percarum* V. Nordmann), and from it radiate many fine threads of chitin, which undoubtedly are the cause of the extremely intimate coalescence with the mucous membrane. The proximal surface of the plate is strengthened by a reticulum of chitinous bars, which become narrower as they approach the margin of the plate.

I have not had the opportunity of examining any living specimens, and am thus unable to contribute anything to the further knowledge of the soft parts.

Fig. 5 represents the post-abdomen of the female before the spermatophores are attached. The two canals for impregnation open upon its extremity: their walls are chitinous, and are especially thick posteriorly. In many females the spermatophores (Fig. 3) may be found sometimes empty, with the narrow ends of their terminal capsules inserted in these orifices, while in others nothing remains of the spermatophores, except these capsules. It is in this condition that they were interpreted by Claus[1] as receptacula seminis belonging to the female; but when entire they may usually be separated without difficulty from the female post-abdomen; the greater or less ease with which they may be detached from the terminal orifices depending on the amount of cement with which they have been attached to the orifices. Occasionally the cement may be present in such quantities as to deform the post-abdomen. The mode of formation of the brown capsules and of the cement is discussed further on.

The male measures as much as 1½ mm., thus being fully one-third of the length of the female. Usually I have found the male attached to the post-abdomen of the female, occasionally further forward on the body, in one case on the arms. The appendages of the head,

[1] Zeit. wiss. Zool. XI. The similar structures of Lamproglena have been more recently (Zeit. wiss. Zool. XXI.) spoken of by Claus as belonging to the spermatophoral apparatus.

although proportionately smaller, have all the specific characteristics of the female. The antennulæ (Fig. 7) are slenderer, and the internal bristles of the basal joints more distinct, while the hooks on the external rami of the antennæ are simple, and do not present the toothed sickle-shaped form observable in the female. The strengthening chitinous plates (*ch.*, Fig. 7) are also of different form. The mandibles and maxillæ seem only to differ in size.

The peculiar form of the first maxillipedes described by V. Nordmann for *A. percarum* can also be seen here. The deep and narrow sternum of these appendages (Fig. 8), shaped somewhat like a dice box, gives origin to the powerful adductor muscles, which occupy the greater part of the cavities of the basal joints. Of the two muscles which move the terminal claw-like joint, the flexor is much the more powerful, and keeps the claw shut against the toothed chitinous outgrowth of the basal joint.

The second maxillipedes (Figs. 6 and 9) are two-jointed, the distal joint terminating in two claws, both of which are hinged to it, and which are anterior and posterior in position. The anterior shuts into the posterior, which is hollowed out to receive it. The basal joint is strengthened by a diagonal chitinous bar: it is to this that V. Nordmann refers as a "muscle of almost cartilaginous consistence." The basal joints abut against each other in the middle line, and give rise to a cylindrical structure, which forms a striking feature in the profile view of the male (Fig. 6). This is represented from the ventral aspect in Fig. 9, in which an evident orifice may be seen. This may possibly be the outlet of certain little glandular masses situated in the basal joints of the appendages (*gl.*, Fig. 9), but the want of fresh specimens has hindered a satisfactory elucidation of this organ. The glands may possibly be homologous with the arm glands of the female: whether their secretion is employed for the fixation of the male on the female I have not determined. A thorough examination of the male reproductive apparatus of the Lernæopodidæ is very desirable for the purpose of elucidating the formation of the spermatophores in the Parasitic Copepoda, as Gruber has recently done for the Free forms.[1] I regret that my alcoholic specimens have not permitted an exhaustive study of this point.

[1] Zeit. wiss. Zool. B. XXXII.

Fig. 10 represents the abdomen of the male from the ventral surface, and is intended to illustrate the position of the male reproductive organs. The testes occupy the anterior segment of the abdomen, and the 1st portion of the vas deferens is dilated by the accumulated seminal elements. The 2nd portion is convoluted and beset with glandular tissue, till it opens into the pocket containing the spermatophore in course of formation. The ripe spermatophore may be studied in Fig. 11. No indication of the canal or capsule with which the spermatophore is attached to the female can be seen at this stage. The case of the spermatophore passes by a neck-like constriction into the case of the developing spermatophore, and it is through the aperture formed by the rupture of this constriction that the contents pass out. These correspond to the three elements described by Gruber for the Free Copepoda, viz., a globular central mass, ·085 mm. in diameter, representing the axial cement in the free forms, numbers of rod-like spermatozoa (not more than 2 μ in length), occupying the greater part of the rest of the axis of the spermatophore, and lastly, the refractive polygonal discharging corpuscles (the Austreibemasse of German Zoologists).

These I have only observed in preparations taken from alcoholic specimens of the male, and I have not had the opportunity of studying the mode of fixation of the spermatophore on the female. Two kinds of cement have been described in the Free Copepoda, (1) that situated in the spermatophoral dilation of the vas deferens, which serves to fix the ejected spermatophore to the female, and (2) that in the axis of the spermatophore, and which in Canthocamptus, *e.g.*, forms a curved canal through which the spermatozoa are ejected.

That the former kind of cement exists also in Achtheres is readily seen from the pieces of it adhering to the post-abdomen of the female, and which I have referred to above as being often present in considerable quantity. It appears to be formed by the glands grouped round the lower part of the vas deferens. The second sort of cement is ejected from the spermatophore in the form of a somewhat globular mass, composed of a peripheral translucent layer with finely granular contents. It appears to me that this mass undergoes a change similar to what takes place in Canthocamptus only more complicated, viz., that after the fixation of the spermatophore to the

[1] Gruber Zeit. wiss. Zool. 32, Pl. 25, Fig. 15.

female the globular mass is extruded through the opening in the spermatophoral wall referred to above, and inserted into one of the openings of the canals through which fertilization is effected(v. o. Fig. 5) : its peripheral layer then becomes indurated and brown in colour, and is then transformed into the brown capsule, while its contents are poured out to form the convoluted canal through which the remaining contents of the spermatophore pass into the body of the female. That the brown capsule acts as a sort of receptaculum seminis is also possible : because spermatozoa are to be observed in it, even after the detachment of the empty spermatophore.

DESCRIPTION OF THE PLATES.

PLATE I.

FIGS. 1–11.—Lernæopoda Edwardsii. Figs. 12–18.—Ergasilus Centrarchidarum.

FIG. 1.—Outline of body, female.

FIG. 2.—Outline of head and antennae from upper surface ; *ol*, the upper lip ; a^1, antennulae ; a^{11}, antennae.

FIG. 3.—Ventral surface of head ; *d*, the dorsal ; *v*, the ventral branch of the antennae ; *o* and o^1, chitinous outgrowths on the latter ; *ch*, chitinous plate in 2nd joint of antenna ; *mx*, maxilla ; mxp^2, the internal maxillipedes, the second pair according to some morphologists.

FIG. 4.—One of the first pair of antennae.

FIG. 5.—One of the second pair of antennae from the outer side ; *t*, the terminal joint of the ventral ramus.

FIG. 6.—Toothed part of mandible.

FIG. 7.—Maxilla with palp, *mxt*.

FIG. 8.—Chitinous bulla from surface.

FIG. 9.—Inner surface of one half of a bulla in connection with the arm.

FIG. 10.—An internal maxillipede.

FIG. 11.—The free border of the lower lip.

FIG. 12.—Ergasilus Centrarchidarum from ventral surface ; 1—5, the natatory limbs.

FIG. 13.—The 1st pair of antennae from behind.

FIG. 14.—The 2nd pair ; c^1 c^2 c^3, hinges between the various joints ; e^1 e^2 e^3, extensor muscles ; *f*, flexor ; *st*, antennary sternum.

FIG. 15.—Mouth-parts; *mx*, maxilla; *mxp*, maxillipede; *st*, maxillipedary sternum; *mm*, muscles; *ch*, points to the chitinous bar which runs from the socket of maxillipede to the socket of the maxilla.

FIG. 16.—1st pair of natatory limbs; *s*, the sternum; *a*, the socket; *b*, the basal joint; *ri*, ramus internus; *re*, ramus externus.

FIG. 17.—Genital segment and rest of abdomen from below; *go*, genital orifice; *ch*, chitinous rods.

FIG. 18.—Attachment of egg-sac to genital aperature, showing the disposition of the chitinous rods.

PLATE II.

ILLUSTRATING ACHTHERES MICROPTERI.

FIG. 1.—Head of female from ventral surface; lettering as above.

FIG. 2.—Mandible of female.

FIG. 3.—Empty spermatophore detached from female.

FIG. 4.—Internal maxillipedes.

FIG. 5.—End of abdomen, female, to show the canals for impregnation with their orifices, *v o*, to which the brown capsules are often found attached.

FIG. 6.—Outline of male from side; *m*, the mouth; *p*, the cylindrical process from the external maxillipedes.

FIG. 7.—The two pairs of antennae of the male from the inner aspect; *ch*, the chitinous supporting plates.

FIG. 8.—First pair of maxillipedes.

FIG. 9.—Right 2nd maxillipedes from below; p^1, the cylindrical process.

FIG. 10.—Abdomen of male from below; the preparation is slightly oblique; *f*, the furcal appendages; *gl*, the glandular heaps in these; *a*, the arms; *in*, the intestine; *m m*, muscles of the abdominal wall broken; *t*, the testis; vd^1, 1st, vd^2, 2nd portion of vas deferens.

FIG. 11.—Spermatophores dissected out, the ripe one ruptured below the neck-like constriction which joins it to the developing spermatophore; the globular cement mass is emerging, behind it are the rod-like spermatozoa; the discharging corpuscles still line the wall of the spermatophore; *spp*, the spermatophoral pouch; *gl*, the glands which secrete the cement which fixes the spermatophore in the first place to the abdomen of the female.

NOTICE OF A

REMARKABLE MEMORIAL HORN,

THE PLEDGE OF A TREATY WITH THE CREEK NATION IN 1765.

BY DANIEL WILSON, LL.D., F.R.S.E.,
President of University College.

Accidental circumstances have recently brought under my notice, and ultimately led to the acquisition for the museum of the University of Toronto, of a curious relic of one of the great Indian confederacies which still maintained its influence as the colonial history of the older plantations of North America drew to a close. The date on the memorial horn now referred to carries the mind back to a period when the warriors of the Creek nation, to whom it refers, were still a powerful native confederacy; and negotiated with haughty condescension, alike with their Indian rivals, and with the representatives of the Sovereign of Great Britain. The Creek nation has not, even now, passed away. Some of the members of the confederacy still claim a share in their ancient inheritance; but in the intervening century the marvellous changes which have transpired render the historical memorial here referred to scarcely less strange than if it recorded some of the first interviews with the men of the new world by European adventurers of the sixteenth, instead of the eighteenth century.

The Creek nation is not to be confounded with the Crees of our Canadian North-west. An extensive tract of country in what now constitutes the Southern States was, in the 18th century, occupied by the Cherokees, Choctaws, Chickasaws, Catawbas, Uchees, and Muscogees. To all of those the English appear to have loosely applied the term "*Creeks.*" But the name strictly belongs to a nation formed by the union of a number of minor Indian tribes with the Muscogees, who occupied the country in the northern part of the States of Georgia and Alabama, watered by the Chatahoochee and the Flint rivers; the Alabama river forming the contested boundary

line between the Creeks and the Choctaws. The Muscogees, who were the central tribe of the powerful Creek confederacy, cherished a tradition that their ancestors first issued out of a cave near the Alabama river. De Brahm reckoned the number of the Creeks at 15,000, including women and children. They were brave and powerful warriors, shrewd and politic in their relations with outsiders; and intensely jealous of all, whether red or white men, who did not belong to their own confederacy.

De Bry, in his "*Brevis Narratio,*" 1591, presents a spirited description of the Mico, or chief, and his warriors, in convention. A council meeting was opened by the cup-bearer handing to him a shell filled with a decoction of the *cassine* or *ilex yupon.* This is a powerful diuretic; and its medicinal influences were invoked to purge them from all hindrance to thoughtful deliberation. This done, all partook of it, drinking it from shells made of the large pyneæ of the Gulf. They next engaged in a solemn dance; and then, seated in the Council House, listened to the addresses of the orators and principal men among their tribes. When this was done, the Mico sprinkled them all with water, saying: "Thus may the blood of your enemies flow freely." Then he poured water on the council fire and extinguished it, exclaiming: "Thus as I extinguish the flames so may your enemies be vanquished and exterminated."

The curious relic of this ancient Indian people, which has been recently acquired for the museum of the University of Toronto, was the property of Mr. J. A. R. White, of Walkerton, Ontario; and, as will be seen, is not only an interesting memorial of colonial intercourse with one of the most powerful southern tribes upwards of a century ago; but has acquired altogether novel and romantic associations from the more recent incidents of its singular history. Its late owner served in the Royal Engineers, and, as a member of that corps, was during the terrible revolt of the Sepoys in British India. He was present, along with his company, at the siege of Lucknow, and took this horn from the body of a Sewor, or light dragoon of the Bengal mutineers, killed in a skirmish at the stone bridge at Lucknow, on the 17th March, 1857. The native Sewor, he presumes, had acquired it among the spoils of some English dwelling sacked by the mutineers. The inscription shows it to have originally belonged to a British officer; but the date carries us back upwards of a century; and so adds to the singularity of the recovery of this

curious relic of a conference with the warriors of the Creek nation in 1765, away on the opposite side of the globe, on one of the remote tributaries of the Ganges.

The style of engraving of the horn fully accords with its date. A shield, left blank, has inscribed below it:

"WILLIAM SHARP, ESQ., LIEUT. OF THE NINTH REGIMENT, 1766."

This is, no doubt, the original owner of the horn. At a table, seated under a canopy, are a group apparently of British officers, wearing the three-cocked hats of the 18th century. In front a group of Indians appears seated on the ground: with the exception of two who occupy chairs nearer the table, and smoke their tomahawk pipes. Behind the officers another group of Indians engage in a dance: and this inscription is graven below: "An Indian beloved dance performed by ye Creeks." Underneath the whole is this inscription: "The Congrass held at Picalata betwixt Governor Grant the Head Men and Warriors of the Creek Nation, November the 17th, 1765." Beneath this, in reverse, is a man shooting at a flying deer.

The horn, it may be added, appears to have been originally a powder horn. But it was cracked, and the bottom detached from it, as its late owner believed, owing to the native Sewor, from whose body he took it, having fallen on it when he received his death blow. It has subsequently been protected, as will be seen, by a silver rim placed round the lower end, so as to give it the appearance of a hunting horn.

Picalata may probably still be identified in the Picolata, a small portal town, in St. John's County, Florida. If so, it indicates the site chosen for the Congress of 1765, considerably to the south of the region occupied by the principal members of the Creek confederacy.

In Brownell's "Indian Races," and also in Drake's "Biography and History of the Indians of North America," notices occur of Colonel James Grant—the same person, in all probability, as is named on the inscribed horn as Governor Grant. French emissaries were busy fomenting strife, and exciting the Indians of Carolina against the English. At a grand conclave of the Cherokee nation in 1760, Latinac, a French officer, stepped out and drove his hatchet into a log, calling out: "Who is the man that will take this up for

the King of France." Saloné, a young warrior of Estatoe, laid hold of it and cried out: "I am for war! The spirits of our brothers who have been slain still call upon us to revenge their death. He is no better than a woman who refuses to follow me." It was immediately after this event that Col. Grant assumed command of the British forces in Carolina. Brownell says:

"In the following spring (*i.e.* in 1761), Col. James Grant, who had succeeded to the command of the Highlanders employed in British service in America, commenced active operations against the belligerent nation—the Cherokees. What with the aid of the Provincials and friendly Indians, he was at the head of about twenty-six hundred men. The Chickasaws and Catawbas lent some assistance to the English; but the Creeks are said to have alternately inclined to the French or English, according as they received or hoped for favours and presents.

"The army reached Fort Prince George on the 27th of May (1761), and there old Attakullakulla, a Cherokee chief who had been long the fast friend of the English, made his appearance, deprecating the proposed vengeance of the whites upon his people. He was told that the English still felt the strongest regard for him individually, but that the ill-will and misconduct of the majority of the nation were too palpable and gross to be suffered to go longer unpunished. Colonel Grant marched from the fort in the month of June. The Cherokees made a desperate but unavailing stand; they were routed and dispersed, leaving their towns and villages of the interior to be destroyed by the invaders. Etchoe was burnt on the day following the battle. . . . Upon the return of the army to Fort Prince George, after this campaign, Attakullakulla again visited the camp, bringing with him a number of other Cherokee chiefs. Broken down by their disastrous losses, and disgusted with the deceitful promises of the French, they gladly acceded to such terms as Col. Grant thought fit to impose, and a treaty of peace was formally concluded."

Drake, in referring to the same campaign against the Indians of Carolina, says:

"Such was the condition of the country that a second application was made to General Amherst for aid, and he promptly afforded it. Colonel James Grant arrived there early in 1761, and not long after took the field with a force of English and Indians, amounting to

about 2,600 men. He traversed the Cherokee country, and subdued that people in a hard fought battle near the same place where Col. Montgomery was attacked the year before. It lasted about three hours, in which about 60 whites were killed and wounded. The loss of the Indians was unknown. Colonel Grant ordered his dead to be sunk in the river, that the Indians might not find them to practice upon them their barbarities. He then proceeded to the destruction of their towns, 15 in number, which he accomplished without molestation. Peace was at last effected by the mediation of Attakullakulla."

After this date, 1762, it is said: "Affairs looked peaceable and prosperous for some years." The natives made over a large additional tract of land to the growing colony of Georgia. The date, 1765, does not appear. But in 1767, there was temporary trouble, settled by Governor Wright at Savannah. The Creeks occasioned this trouble, having seized, or stolen, as it was said, some horses found on their territory belonging to the whites.

It thus appears that, at the date of the Congress named on the curious memorial horn, which perpetuates its graven record of the incidents of a conference with the Creek nation on the 17th November, 1765, the Creeks and other nations of the great Muscogee confederacy were being stirred up to war against the English, chiefly through the machinations of their French rivals. In 1761, Colonel James Grant was appointed by General Amherst, the Commander-in-Chief, to conduct the military operations in Carolina against the belligerent Indians; and to him, it may be assumed, was thereafter entrusted the civil, as well as the military, conduct of affairs in the extensive southern region occupied by the Indian nations of the Muscogee confederacy. The southern Indians were old enemies of the Iroquois, the staunch allies of the English against the French on the St. Lawrence; and were the more easily stirred up to attack the English settlers in Virginia and the Carolinas. But James Adair—a trader long resident among the southern Indians—in a "History of the American Indians," published by him in 1775, ascribes their inveterate hostility to the English to their crediting to the machinations of the latter the introduction of the small-pox. When South Carolina was first settled, he says: "The Catawbas were a numerous and warlike people, mustering about 1,500 warriors, but small-pox and the use of ardent spirits reduced them to less than

a tenth of their former numbers." And he describes a waste area seven miles in extent, still showing the traces of cultivation once carried on by them throughout its whole extent. In 1738, nearly half of the Cherokees perished by the small-pox; but the Creeks early recognized the necessity of isolating those attacked by the disease; and so, to a large extent, escaped the decimating influence of this terrible scourge.

The Indians of the Six Nations still preserve at Tuscarora, on the Grand River, the Silver Communion Service brought with them from the old home of their most warlike tribe, in the Mohawk Valley, of the State of New York, and which bears the inscription:

"A. R. 1711. THE GIFT OF HER MAJESTY, ANN, BY THE GRACE OF GOD, OF GREAT BRITAIN, FRANCE, AND IRELAND, AND OF HER PLANTATIONS IN NORTH AMERICA, QUEEN: TO HER INDIAN CHAPPEL OF THE MOHAWKS."

This singularly interesting memorial is of earlier date, and associated alike with a race peculiarly identified with Canadian history and with its royal donor. Nevertheless the Picalata horn may be fitly classed with the Silver Communion Plate "of the Indian Chapel of the Mohawks," as a historical memorial of incidents otherwise lost sight of, and of a representative Indian nation now disappearing from the scenes where little more than a century ago it treated on proud equality with the representatives of the British Crown.

THE MAGNETIC IRON ORES

OF VICTORIA COUNTY,

WITH NOTES ON CHARCOAL IRON SMELTING.

BY W. HAMILTON MERRITT, F. G. S., Assoc. R. S. M., &c., &c.

Mining Engineer and Metallurgist, Mail Building, Toronto.

During the past summer I was called upon to make a general report of the iron occurrences in the vicinity of the Victoria Railroad, and I now have much pleasure in bringing to your notice, in a condensed form, the result of my investigations.

The Miles Location, or Old Snowdon Mine, has received notice at the hands of Prof. Chapman in a report published in 1874, therefore the general character of the ore will be known to some of you.

The Victoria Railroad, as you know, runs from Lindsay to Haliburton, some 55 miles. A short distance north of Lindsay a branch was built by Mr. Miles, which runs in a westwardly direction to his iron location, six miles from the main line. I shall now briefly refer to the GEOLOGICAL OUTLINES, which I do not think have been previously recorded.

Going north from Lindsay, several escapements of horizontal beds of Silurian Limestone are passed through. On crossing the Burnt River, after leaving Fenelon Falls, an outcrop of Granite appears on west side of the Railroad. Some compact limestone, approaching a marble in texture, which takes a good polish, and a bed of lithographic stone, are passed in cuttings near Felly's Bridge.

The crystalline rocks come in between Felly's Bridge and Kinmount (at which place they are well defined), but owing to the overgrown condition of the country, it was impossible to note their junction.

The crystalline rocks belong to the Laurentian Series, the strongest iron carrying rocks in our country. Their strike here, as is general, is about N. N. E. and S. S. W. and dip about 40 % E.

They consist of alternating granite, gneiss, syenite and crystalline limestone, with occasional bands of dioritic rocks, which, however, are not so strongly developed in this as in the Madoc region.

The occurrence of labradorite rock or norite, which is found at the Miles Location, and titaniferous iron beds, which occur at Pine Lake and other places, would seem to point to the norian or upper laurentian of Logan, but there is not a universal enough development to justify such a conclusion.

To the East of Kinmount the gneiss is replaced by crystalline limestone, in which rock the Victoria, or Old Snowdon, mine occurs. Continuing Eastward, between the Victoria mine and the Howland and Ledyard locations, the road is very circuitous, and not on the map, therefore my observations of the rocks might be misleading as to their actual occurrence. Halfway between the Snowdon and Ledyard locations, quartzite and a fine grained pinkish syenite take the place of limestone. The crystalline limestone appears again before arriving at the Ledyard location, and continues westward beyond the Howland property further than I went.

In the Ledyard property there is a band of dioritic rock (doleritic in places), in which are the iron occurrences found in that property.

Coming back to Kinmount, and then going in a westwardly direction, the gneiss is replaced by a band of crystalline limestone a mile wide, which again is immediatety succeeded by gneiss and syenite.

Not far from the limestone the Paxton mine is in a syenite gneiss, with narrow beds of crystalline limestone occuring in places both above and below the ore

From Kinmount North the general character of rocks is precisely the same as already mentioned, granite, gneiss, syenite and crystalline limestone. The geological features of that part of the country which I saw are precisely the same as the Madoc region, with the exception of a stronger development of the dioritic ridges in the Madoc region.

In this district, hornblendic pyroxenic rock and crystalline limestone are, as a rule, associated with the iron ore. In the Madoc district the Hæmatite mine is an example of the intimate connection of the iron ore with crystalline limestone, while the Seymore mine is an example where that rock is wanting.

From the accumulation of instances, however, it would seem that in searching for iron ores, especially in the Victoria district, it would be well to keep in the vicinity of the bands of crystalline limestone, for as a rule the ores occur both in it and near its junction with granite, hornblendic and pyroxenic rocks.

I understand it to have been shewn by Mr. Vennor, in his investigations in Hastings, that the iron deposits occur in defined belts, which can be traced for long distances. My investigation in Victoria unfortunately was of too local a character to enable me to establish the continuity of the ore deposits, but it seems probable that in Snowdon Township the deposits are not merely local, but that a belt can be followed from Lot 20 in the I. Concession as far as Lot 30 in the V. Concession, a distance of 3 miles, including five locations, or possibly further in the same direction.

In Sweden the mineral bearing horizons can be followed, having the same direction as the encasing rocks, and fresh masses of mineral will be met with at intervals for dozens of kilometers, and each bed generally consists of several parallel beds separated by rock more or less barren.

In the famous Dannamore district the magnetite occurs in an irregular belt of a mile and a half in length, embedded in crystalline limestone, and it has been mined to a depth of more than 600 feet.

The iron occurrences that came under my notice bear the character of beds deposited with the enclosing rocks, the lie both of the ore bed and the intercalated minerals being the same as that of the country rock.

The Victoria mine would seem an exception, as the strike of the bed is 42 ° N. W. and S. E., being nearly at an angle of 45 ° to the general strike of the rocks of the country ; but it is possible that a fault running through the valley immediately to the N. W. may have altered the strike of the ore deposits, especially as at the edge of the valley, close to which the mine has been opened, there is evidence of much disturbance.

I shall not inflict you with the detailed description of the various mines in operation, and undeveloped locations that I was obliged to include in my report.

I shall simply give the result of a number of analyses from specimens I obtained at the mines, which shew, firstly, the richness of selected ore, which is better than the average shipped to the United States ; secondly, the average ore without close selection ; and thirdly, the ore that has been thrown on the dump as too poor to ship to Bessimer works.

The ore varies in texture from crystalline magnetite, with small crystals and an open texture practically free from sulphur, as found

at the Paxton mine in Lutterworth, or a closer grained magnetite carrying a certain amount of pyrites, as is seen in the Snowdon occurrences, to a compact crystalline ore containing more or less titanium, such as is found at Pine Lake and other places.

In all cases the analyses of the picked specimens were practically the same, about 60 % metallic iron, and practically free from phosphorus, sulphur and titanium.

The average samples of ores from the Snowdon properties, which would represent the character of the Victoria, Miles, Ledyard and Howland, is the following :

Silica	21.20
Oxides of Iron	66.28
Alumina	3.70
Lime	5.04
Magnesia	2.19
Sulphur	1.64
Phosphoros	.02
Titanium	.00
	100.07
Metallic Iron	48.00

These would require thorough calcining to remove the sulphur. At the Howland mine it was calcined very roughly in large pieces in heaps of 100 tons, but as samples of the calcined ore which I obtained shewed the same amount of sulphur as the raw ore, the present system of calcining is practically useless.

Average ore from the Paxton mine in Lutterworth analysed :

Oxides of Iron	67.77
Silica	19.30
Alumina	6.24
Lime	3.81
Magnesia	3.38
Sulphur	.03
Phosphorus	None.
Titanium	.15
	100 68
Metallic Iron	48.64

This ore has the decided advantage of being so free from sulphur that it would not require calcining.

The third class of samples I collected and mentioned as taken from the dump, shewed that waste ore contained over 30 % metallic iron.

There is a good deal of hornblend intimately mixed with these ores. Microscopic examinations shewed a little more free silica in the Paxton than the other ores.

The minerals occurring with the ores in this district are calcite, hornblend, actinolite, augite, felspar, mica, iron pyrites, quartz, and I found specimens of olevine, scapolite and serpentine.

To obtain a true estimate of the value of the above ores, we will consider those of Sweden which most closely resemble them, and which are at the same time recognized as equal to any in the world.

In a very interesting pamphlet on the actual state of the iron industry in Sweden, written in 1878, by Richard Akerman, Professor at the School of Mines of Stockholm, and one of the best known metallurgists of the day, a very great number of analyses of Swedish iron ores are given, nearly 800. The average ore as shewn by these contains from 45 to 50 % metallic iron, and the majority requires calcining to remove the sulphur. Mr. Akerman states that some calcareous ores, especially useful for mixing with the silicious ores, are mined as low as 20 % iron. This pamphlet also tells us that in Sweden, with a smaller population than ourselves, 484 mines were worked in 1876, from which 787,950 tons of ore were raised. From the above facts it is evident that our magnetic iron ores are equal in composition to the celebrated Swedish ore, and they are similar in occurrence. Therefore, notwithstanding the fact that it does not pay to ship under 50 % metallic iron to the United States, the majority of Swedish ore would be excluded- -by which fact we can rest assured that our magnetic iron ores must soon be much more extensively worked; which, with the aid of the diamond borer for exploration and steam mills, will, without doubt, be most successfully accomplished.

The Cleveland and Pittsburg smelters are looking about most anxiously for new supplies of ores, as those from Lake Superior are becoming very expensive. They are even meditating opening up part of West Virginia with a Railroad 300 miles long, to get at a low grade ore. We have the advantages to offer them of better ore and cheap return freight in coal vessels to Cleveland.

A few words on the question of iron smelting with charcoal I thought would not be amiss in connection with this paper.

It is needless to mention there is no industry that is of such importance to the prosperity of a country as the smelting of iron ; England is of course the most striking example of this. Were it not for her smelting works the United States would not have the balance of her commerce on the export side.

Concomitantly with the present great prosperity in France, her iron industries have taken most gigantic strides.

Belgium, Germany, Sweden, and even Russia, are examples of the great benefits which accrue to countries from the encouragement of iron smelting.

In Ontario it is a question whether we could smelt with mineral fuel, without a high protection.

It seems very probable that smelting with charcoal can be carried on with profit in those parts of the Province where iron ore, large quantities of timber, Railroad facilities and good water power are combined.

These essentials are united in the Victoria district. As before mentioned, the standard required in the ore to be shipped to the United States is such a very high ore that a seriously large proportion of good ore is left as a waste product.

In the vicinity of the iron mines in Victoria County, there are large tracts of woods which have been partially culled of the choicest timber, yet enough remains for the manufacture of charcoal for a long time to come. In lumbering, the branches and tops of the trees are left; these make excellent charcoal. Therefore a smelting works would prevent great waste both of the mine and forest. Settlers would soon find the burning of charcoal a handsome little perquisite.

One point in locating a works is important, and that is unless there is in any deposit a proved quality of ore in sight, it would be very dangerous to risk the supply of a works to one deposit, as the deposits vary much in size; but the smelting works should be in a position to tap the production of several proved deposits.

In Sweden it is common to combine a saw mill with iron smelting works, as the refuse is made of much use in producing gas for the regenerative furnaces.

The cost of erection of a plain but substantial plant, with charcoal furnaces, to turn out 100 tons (minimum) per week, would be probably $60,000. With Whitewell hot blast stoves, Westman calcining

kilns, and expenses connected with water power and other details, the total cost would reach the neighbourhood of $100,000.

As regards the production of charcoal iron. In 1880 the United States produced 537,558 gross tons of charcoal pig iron from 151 blast furnaces, and in 1879 Sweden 336,176 gross tons of pig iron from 182 blast furnaces.

In 1880 France turned out 66,330 tons of charcoal pig, and 29,148 tons with coke and charcoal mixed. Styria, Carinthia, Carniola, Austrian Tyrol and Saltzburg produced in 1874 collectively 217,400 tons, and Russia in 1879 produced 429,865 gross tons of pig iron, mostly with charcoal and magnetite as the ore. We might say that about two million tons of iron are produced from charcoal per annum.

In Austria, two parts of compressed peat and one of charcoal are used at Vordernberg. Smelting by lignite has at last been successfully accomplished in the latter country. This question is of vital importance to our North-West territories.

I will close by finally stating that the question of charcoal smelting is one worthy of attention, and our local government would do well to have a thorough report made upon the subject.

CANADIAN INSTITUTE.

REPORT OF THE COUNCIL FOR 1881-82.

In presenting this their 33rd Annual Report, the Council of the Canadian Institute are happy to be able to state that the progress of the Institute during the last Session has been upon the whole satisfactory.

One important change has been successfully made in reverting to the old weekly meetings, instead of only on alternate weeks, and it is satisfactory to be able to report that the meetings have been well attended, and many interesting papers have been read by the members. There is, however, still room for improvement in that respect, and the Council sees no reason to doubt that in the next Session, when the members have become more used to the new arrangement, there will be a further increase of attendance, and more readiness in bringing interesting communications before the meetings.

Another arrangement of some importance has been accomplished, namely, that the use of our building and library has been extended to the Natural History Society, thus giving some aid and encouragement to a Society having similar objects with our own, and at the same time making the advantages of our Institute more generally known.

Another important transaction has been the sale of about 30 feet of the vacant land on the western side of our building, thus enabling us to reduce our mortgage debt by nearly one-third, with a proportionate decrease of the interest payable; and we are not without hopes that an arrangement may be made to reduce the rate of intetest now paid. This will probably enable us to enlarge the publication of our transactions, which would add very materially to the utility of the Canadian Institute.

The Treasurer's reports, the papers communicated at the meetings, the additions to the library, and the present condition of the membership, are, as usual, appended.

All which is respectfully submitted.

JOHN LANGTON, *President.*

MEMBERSHIP.

Members at the commencement of Session, 1881-82	126
Members elected during the Session	17
	143
Deaths	4
Total Membership, March 31st, 1882	139
Composed of :	
Corresponding Member	1
Honorary Members	2
Life Members	17
Ordinary	119
	139

REPORT FROM TREASURER FOR SESSION OF 1881-82.

I submit accounts shewing the financial condition of the Canadian Institute, and consider further comment unnecessary.

SUMMARY OF CURRENT ACCOUNT TO 31ST MARCH, 1882.

To balance in hands of Treasurer	$511 33
" Cash from Sale of Land	1,588 75
" Cash from Annual Subscriptions	294 00
" Subscriptions to Building Fund	158 00
" Life Membership	25 00
" Rent from Warehouse	60 00
" Rent from Medical Society, Toronto	50 00
" Rent from Natural History Society	7 50
" Journals, &c., sold	4 75
" Cash due to Treasurer	133 75
	$2,833 08

By Principal on Mortgage	$1,589 00
" Interest on Mortgage	350 00
" Salary to Librarian	336 00
" Printing Journal	152 13
" Fuel	86 93
" Periodicals	80 55
" Advertising	67 00
" Insurance	42 50
" Commission on Sale of Land	39 72
" Water	24 00
" Gas	12 43
" Taxes	10 94
" Express charges	10 82
" Postage and Telegrams	8 92
" Contingencies	7 85
" Repairs	6 79
" Engrossing	5 00
" Law expenses	2 50
	$2,833 08

We certify to have examined the vouchers and the addition, which we find correct. The balance due the Treasurer being one hundred and thirty-three dollars and seventy-five cents.

JAMES BAIN, jun.,
G. KENNEDY, } *Auditors.*

24th April, 1882.

BUILDING FUND ACCOUNT.

To Amount at last Audit		$1,347 00
" Subscription from R. Wilkes		100 00
" "	Copp, Clark & Co.	30 00
" "	Prof. R. R. Wright	10 00
" "	T. Kirkland	6 00
" "	Dr. Ellis	10 00
" "	N. Cawdry	2 00
		$1,505 00
" Sale of 30 feet of Land		1,588 75
		$3,093 75
By Amount due on Mortgage		$5,000 00
" Amount paid on Mortgage		1,589 00
" Amount now due and bearing interest at 7 per cent.		$3,411 00

ASSETS AND LIABILITIES.

Assets.

Canadian Institute Building		$11,000 00
" "	Warehouse	720 00
" "	Ground	2,500 00
" "	Library	5,000 00
" "	Specimens	1,200 90
" "	Personal Property	400 00
		$20,820 00

Liability.

Amount due by Mortgage	$3,411 00

JOHN NOTMAN,
Treasurer.

COMMUNICATIONS.

The following valuable and interesting papers and communications were read and received from time to time at the ordinary meetings held during the Session 1881-2:

May 14, 1881.—Annual Report and Election of Officers. C. Carpmael, M.A., exhibited and explained the photographic curves from the instruments during the magnetic storm on the 11th, 12th and 13th days of August, 1880, and also of the storm on the 31st January, 1881.

October 29, 1881.—Inaugural address by the President.

November 5, 1881.—Rev. Dr. Scadding, on "The Dethronement of Latin in the Modern Scholastic World," being a continuation of "A Boy's Books, Then and Now."

November 12, 1881.—Prof. R. Ramsay Wright, B.Sc., on "A Cell and its Parasites."

November 19, 1881.—Dr. W. H. Ellis, M.A., on "The Water Supply of Toronto."

November 26, 1881.—Dr. Covernton, on "State Medicine: Ancient, Medieval, and Modern."

December 3, 1881.—John Notman, Esq., "Remarks on the origin of Numerals.' Paper on "The Genesis of Worlds."

December 10, 1881.—A. Elvins, Esq., on "The Lunar Surface," illustrated by photographs and drawings.

December 17, 1881.—W. Hamilton Merritt, F. G. S., on "The Magnetic Iron Ores of Victoria County," with notes on Charcoal Iron Smelting.

January 14, 1882.—Rev. Professor Campbell, M.A., on "Deciphering Hittite Inscriptions."

January 21, 1882.—Rev. R. Von Pirch, on "Linguistic Studies."

January 28, 1882.—John Langton, M.A., on "Popular Errors and Prejudices."

February 4, 1882.—Dr. J. Workman, on "The Origin of the English Language," with a translation of a Danish poem.

February 11, 1882.—Rev. Dr. MacNish, LL.D., "Are the Poems of Ossian of Scottish or of Irish origin?"

February 18, 1882.—J. M. Buchan, M.A., on "The proportions of the Constituents of the English Language."

February 25, 1882.—Dr. Daniel Wilson, LL.D., on "Incidents illustrative of the changes wrought on the native Indian tribes from the practice of adoption."

March 4, 1882.—C. A. Herschfelder, Esq., on "The manners and customs of the aboriginal Americans."

March 11, 1882.—Dr. P. H. Bryce, M.A., on "Hypnotism and its Phenomena."

March 25, 1882.—Dr. Jos. Workman, "Is it true that the Celtic languages have contributed but little to the English and its affiliated languages?"

April 1, 1882.—Notes on "Vapour Tension and Specific Heat," by W. J. Loudon, B.A.

April 22, 1882.—W. Brodie, Esq., on "Canadian silk producing Moths."

ADDITIONS AND DONATIONS TO THE LIBRARY OF THE CANADIAN INSTITUTE RECEIVED FROM APRIL 1ST, 1881, TO MARCH 31ST, 1882.

CANADA:

The Revue Canadienne, Montreal, 1881.
The Canadian Naturalist, Montreal, No. 1, Vol. X.
The Canadian Journal of Medical Science, 1881.
The Annual Report of the Entomological Society, 1881.
The Canadian Entomologist.

CANADA—(*Continued*).

Report of Progress Geological Survey of Canada, 1880-1881.
Report of Meteorological Service of Canada, 1881.
Pamphlet on the adoption of a Prime Meridian to be common to all Nations, by Sandford Fleming, Esq., C. M. G. (the author).
Report of the Historical and Scientific Society of Manitoba, 1882.
Report of the Superintendent of Education, Quebec, 1881.
Transactions of the Literary and Historical Society, Quebec, 1881.
Statutes of Ontario, 1881.

ENGLAND:

Proceedings of the Geological Society of London, 1881.
Proceedings of the Royal Geographical Society, 1881.
Index and Journal of the Royal Geographical Society, 1881.
Journal of the Royal Microscopical Society, 1881.
Quarterly Journal of the Geological Society, London, 1881.
Journal of the Anthropological Institute, London, 1881.
Transactions of the Manchester Geological Society, 1881.
Transactions of the Cambridge Philosophical Society, 1881.
Proceedings of the Cambridge Philosophical Society, 1881.
Transactions of the Victoria Institute, 1881.
Report of the Leeds Philosophical and Literary Society, 1881.
Southern Skies, by H. E. Lieut.-General Sir J. H. Lefroy, C. B.
Catalogue of the Library of the Royal Geographical Society, 1871.
Pamphlets on Free Trade and Protection, London.
Rainfall and Climate of India, by Sir Joseph Fayrer, K. C. S. I., F. R. S.
Financial Reform Almanack, 1882.
Proceedings of the Manchester Literary and Philosophical Society, 1879.
Memoirs of the Manchester Literary and Philosophical Society, 1879.
Trubner's Literary Record, 1881.
Minutes and Proceedings of the Institute of Civil Engineers, 1880-81.

SCOTLAND:

Transactions of the Edinburgh Geological Society, 1880 and 1881.
Transactions and Proceedings of the Botanical Society, 1881-82.
Proceedings of the Royal Society of Edinburgh, 1879-80.
Proceedings of the Philosophical Society of Glasgow, 1879-80.
Transactions of the Royal Scottish Society of Arts, 1881.
Proceedings of the Royal Physical Society, Edinburgh, 1879-80.

IRELAND:

Transactions of the Royal Irish Academy, Dublin, 1880-81.
Proceedings of the Royal Dublin Society, 1881.
Transactions of the Royal Dublin Society, 1881.
Journal of the Royal Geological Society of Ireland.

INDIA:

Records of Geological Survey of India, 1880-81.
Memoirs of Geological Survey of India, 1880-81.
Memoirs of Geological Palæoritologia Indica, 1880.

NEW SOUTH WALES:

Reports of the Council of Education, 1879.
Journal and Proceedings of the Royal Society, 1879-80.
Annual Report, Department of Mines, for 1878-9.
Maps, Department of Mines, for 1878-9.
Report upon certain Museums, by A. Liversidge, 1880.

NEW ZEALAND:

Transactions and Proceedings of the New Zealand Institute, 1880.

TASMANIA:

Proceedings and Report of the Royal Society of Tasmania, 1880.

UNITED STATES:

The Names of the Gods in the Riche Myths, Central America, by D. G. Brinton, M.D.
The American Journal of Science, 1881.
The Journal of the Franklin Institute, 1881.
Proceedings of the American Antiquarian Society, 1881-2.
Transactions of the Academy of Science of St. Louis, 1880.
Anniversary Memoirs of the Boston Society of Natural History, 1830-80.
Transactions of the New York Academy of Sciences, 1881-82.
Bulletin of the Buffalo Society of Natural Sciences, 1881.
Annals of the New York Academy of Sciences, 1881.
Report of the New York State Museum of Natural History, 1879.
Records of the Proprietors of the Worcester Society of Antiquaries, 1881.
The Philadelphia Magazine of History and Biography, 1881.
Proceedings of the Academy of Natural Sciences of Philadelphia, 1881.
Journal of Speculative Philosophy, by W. T. Harris, 1881.
Bulletin of the Museum of Comparative Zoology, Cambridge, 1881.
Report of the Museum of Comparative Zoology, Cambridge, 1880-81.
Proceedings of the Worcester Society of Antiquity, 1881.
Proceedings of the Boston Society of Natural History, 1881.
Memoirs of the Boston Society of Natural History, 1881.
Report of the Comptroller of the Currency, 1880.
Library Bulletin of the Harvard University, 1881.
Bulletin of the Essex Institute, 1881.
Visitors' Guide to Salem. H. P. Ives, Publisher.
Annual Report of the Peabody Institute, Baltimore, 1881.
Report of the New York State Library, 1880.
Bridgeport Scientific Society, Annual Address by President N. H. Powers, D.D., 1881.
Memoirs of the Peabody Academy of Science, Salem, 1881.

AUSTRIA:

Koniglich bohmische Gesellschaft der Wissenschaften, Prag, 1879-80.
K. K. Sternwarte zu Prag. Beobachtungen, Prag, 1879-80.
K. K. Geographische Gesellschaft, Vienna, 1879-80.
K. K. Zoologisch-Botanische Gesellschaft, Vienna, 1880.
K. K. Geologische Reichsanstadt, Vienna, 1880-81.

BELGIUM :

Academie Royal des Sciences, des Lettres, et des Beaux Arts, Brussels, 1878-9-80.

DENMARK :

Academie Royal des Sciences, Copenhagen, 1880-81.

FRANCE :

Societé Nationale, des Naturales Sciences, Cherbourg, 1879.
Societé Geologique De Normandie, Havre, 1879.
Societé Ingenieurs Civils, Paris, 1881.
Societé Geologique, Paris, 1880.

GERMANY :

Naturhistorischer Verein der Preussischen Rheinlande und Westphalens, Bonn, 1881.
Naturwissenschaftlichen Vereins zu Bremen, Bremen, 1880-81.
Nat. ges. Gesellschaft. Isis in Dresden, Dresden, 1881.
K. Geselischaft der Wissenschaften, Gottingen, 1881.
Naturwissenschaftlichen Vereins von Hamburg-Altona, Hamburg, 1881.
Geographischen Gesellschaft zu Hannover, Hannover, 1879.
Die Physikalisch-Okonische Gesellschaft, Konigsberg, 1876-80.
Konigliche Akademie der Wissenschaften in Munchen, Munchen, 1880.
Der K. Sternwarte bie Munchen, Munchen, 1881.

ITALY :

Del Re Instituto Di Stadi Superiori e Di Perfezionamento in Firenze, Florence, 1880-81.
Societé Toscana Di Scienza Naturale, Pisa, 1881.
Cosmos. Di Guido Cora, Torino, 1881.

MEXICO :

Museo Nagional De Mexico, Mexico, 1880-81.

NETHERLANDS :

Koninklijkf Akademie Van Wetenscappen, Amsterdam, 1879-80.
Societé Hollandaise Des Sciences à Harlem, Harlem, 1880-81.
Archives Du Musee Teyler, Harlem, 1879-81.
Koninklijk Nederlandsch Meteorologisch Institut, Utrecht, 1879-80.

SWEDEN :

Kongliga Svenska Vetenskapo-Akademie, Stockholm, 1876-81.