PLATE IX.

a.	Anus	*l b.*	Labrum.
a b.	Abdomen.	*o c.*	Compound eye.
c p.	Carapace.	*o c l.*	Simple eye.
c t.	Cuticle.	*p l.*	Procephalic lobe.
d p.	Deutoplasm.	*r.*	Rostrum.
f.	Frontal sensory organ.	*α.*	Tail fold.
i.	Intestine.	λ.	Dorsal organ.
l.	Liver.		

The Roman numerals signify the consecutive order of the appendages.

1 – 10. *Development of* SCHIZOPODA, *continued (Mysis). Figures from* ÉDOUARD VAN BENEDEN *and* P.-J. VAN BENEDEN.

1 – 6. *Mysis ferruginea.* From Édouard Van Beneden. 1 – 3, Recherches sur la Composition et la Signification de l'Œuf, Pl. X. Mém. Cour. Acad. Roy. Belgique, XXXIV., 1869. 4 – 6, Recherches sur l'Embryogénie des Crustacés. II. Developpement des Mysis. Bull. Acad. Roy. Belgique, [2.] XXVIII., Pl. III., 1869.

1. Egg showing the commencement of partial segmentation.
2. Later stage in the segmentation. The blastoderm now forms a zone of small extent at one pole of the egg.
3. The blastoderm has extended over the whole surface of the yolk. On the ventral side the cells have a roundish form, while on the dorsal side they are very much flattened.
4. Later stage. *p l*, anterior expansion of the ventral side of the blastoderm to form the procephalic lobes. *α*, fold of the blastoderm which separates the hinder portion (*a b*) of the embryo from the anterior section of the body.
5. Later stage. The embryo is now ready to leave the egg. The three nauplian appendages, two pairs of antennæ, and mandibles (I, II, III) are present, and the embryo is invested with a delicate cuticle. λ, dorsal organ. While within the egg, it will be observed that the body has a ventral flexure, as in Decapod Crustacea.
6. Embryo after it is freed from the egg-membranes. The body now assumes a dorsal flexure.

7 – 10. *Mysis chamæleo.* From P.-J. Van Beneden, Recherches sur les Crustacés du Littoral de Belgique. Mém. Acad. Roy. Belgique, XXXIII., 1860.

7. It has been seen by the previous figures that the *Mysis* embryo leaves the egg with three pairs of appendages like a nauplius. The larva undergoes its further development within the incubatory pouch of the parent. The nauplius skin is not discarded, but accommodates itself to the growth of the larva, forming a protective case, within which the young *Mysis* develops. In the species here figured, the nauplius skin terminates in a pair of setiferous appendages. Within the nauplius skin, the larva has become provided with the full number of cephalo-thoracic appendages in the form of simple buds. These afterwards assume the schizopodous character, the abdominal appendages appear, and the segmentation of the body sets in.
8. Larva just after the nauplius skin has been cast off, much less enlarged than the preceding figure. The stalked eyes (*o c*) are now conspicuous. They have developed from the procephalic lobes of the embryo. The full number of abdominal appendages (XIV – XIX) is now seen, the posterior pair largely developed.
9. Later stage, shortly before leaving the incubatory pouch of the parent.
10. Appendages from the first to the fourteenth (first abdominal) inclusive, to show the double nature of the appendages.

11 – 21. *Development of* PENEUS. *Figures from* FRITZ MÜLLER *and* CARL CLAUS.

11 – 16. From Müller, Die Verwandlung der Garneelen. Arch. Naturgesch., XXIX., Taf. II., 1863.

11. Nauplius stage of a *Peneus*, from Desterro, Brazil. .4 mm. long.
12. Older stage (metanauplius), seen from the side. .5 mm. long. The carapace (*c p*) has commenced, a large labrum (*l b*) is present, together with the rudiments of four pairs of appendages (two pairs of maxillæ and two pairs of maxillipeds) behind the nauplian appendages. A short forked tail has also formed.
13. Third pair of nauplius appendages of a somewhat older stage. At its base is seen the rudiment of the masticatory mandible of later stages.

14. Later stage (protozoëa). The carapace has increased in size. Compound eyes and frontal sense organs (*f*) have appeared, and the appendages (IV–VII) which before were functionless rudiments have developed into biramous swimming organs. The mandible has become reduced to a cutting blade without palpus. The hinder portion of the body has greatly increased in size, and behind the seventh pair of appendages is the indication of a number of somites.

15. Mouth parts of the same, seen from below. The labrum (*l b*) is produced into a prominent spine.

16. Paired eyes of a little older larva.

NOTE.— Although the stages represented in the preceding figures were captured free-swimming on the surface of the sea, and no connection directly established between the several stages or with the parent, there is no reason to doubt the correctness of Müller's identification of the forms as young stages of *Peneus*.

17 – 21. From Claus, Untersuchungen zur Erforschung der Genealogischen Grundlage des Crustaceen-Systems, Taf. II., III., Wien, 1876.

17. Protozoëa stage of *Peneus*. 1¼ mm. long. *o c l*, ocellus. *o c*, paired eyes under the carapace, as in adult of genus *Alpheus*. *f*, frontal sense-organ, similar to that of *Phyllopoda*. Behind the second maxillipeds (VII) are six free thoracic segments. Under the cuticle of the first of these are seen the rudiments of the third maxillipeds (VIII). The abdomen (*a b*) has no free segments yet, but under the skin can be seen the segmentation which causes the six abdominal somites of the next stage.

18. Six thoracic somites and abdomen of a somewhat larger larva, zoëa form. The five anterior somites are now free, the sixth is not yet separated from the telson. It appears that the somites of the thorax and abdomen develop in regular succession from before backwards. The third maxilliped (VIII) is now a free bilobed bud, and behind it are seen the rudiments of the following five pairs of thoracic feet. In the abdominal section of the body the last pair of limbs is apparent as a small bilobed process (XIX) on the sixth somite, and perhaps the slightest trace of the other five pairs is already perceptible.

19. Older zoëa form of the same. The paired eyes are now freed from the carapace and mounted on long stalks. The five posterior pairs of thoracic appendages (those of the left side have been removed in the figure) have developed into prominent biramous sacs, while the third maxillipeds (VIII) are furnished with setæ on each branch. The abdomen has become very long, the telson is separated from the sixth somite by a movable joint, and the posterior appendages (XIX) have assumed the shape of powerful swimmerets. The second antennæ still serve as locomotive organs, in which office the muscular abdomen now assists. The five anterior abdominal somites have not yet developed appendages, at least to any functional degree. The development of the sixth abdominal appendages thus anticipates the development of the anterior pairs, probably on account of their functional importance as swimming organs.

20. Schizopod or Mysis stage of a *Peneus*. 16 mm long. As in the adult *Mysis*, the biramous thoracic feet now serve as swimming organs. All the abdominal limbs are present. The first antennæ have lost their long setæ, and grown an inner branch which becomes the inner flagellum of the adult appendage. The second antennæ have resigned their locomotive office, and their outer branch has become reduced to the antennal "scale" (II′). The nauplius eye has disappeared, and mandibular palpi have developed. The transition from the Mysis stage to the adult is easy, the most marked change consisting in the reduction of the external branches of the five pairs of ambulatory appendages to rudimentary structures.

21. Telson of the same stage.

PLATE X.

Development of SERGESTIDÆ (*Lucifer*). *Figures from* W. K. BROOKS.

NOTE. — The figures on this plate are copied from the original drawings. I am greatly indebted to Dr. Brooks for sending me his drawings and proof of the text of his memoir in advance of its appearance in the Philosophical Transactions of the Royal Society of London, 1882. The memoir is entitled "*Lucifer:* a Study in Morphology."

a.	Anus.	*n'.*	Supra-œsophageal nerve ganglion.
a^1.	First somite of abdomen.	*o c.*	Compound eye.
a^4.	Fourth somite of abdomen.	*o c l.*	Simple eye.
a b.	Abdomen.	*o e s.*	Œsophagus.
c p.	Carapace.	*r.*	Rostrum.
c t.	Embryonic cuticle.	*r e.*	External branch of appendage.
g m.	Gastrula mouth.	*r i.*	Internal branch of appendage.
h.	Heart.	*s t.*	Stomach.
i.	Intestine.	*α.*	Cells which form food-yolk, or possibly mesoblast.
l b.	Labrum.	*β.*	Auditory organ.
l.	Yolk-cells around stomach.	*γ.*	Antennal gland.
m t.	Metastoma.	*ϑ.*	Shell gland.
n.	Sub-œsophageal portion of nervous system.	*ξ.*	Posterior extremity of abdomen or telson.

The Roman numerals indicate the appendages of the body in their consecutive order; the Arabic numerals denote the somites. In *Lucifer* the thirteenth somite and its appendages (last thoracic) are not developed in any stage.

1. Egg undergoing segmentation. There are eight segmentation spheres in the stage figured. The segmentation is regular and total, and a segmentation cavity is formed in the centre of the egg.
2. Optical section of egg at later stage. One pole has become flattened, and the cell, *α*, which lies in the centre of the flattened area, has its broad end directed toward the segmentation cavity, while the other cells have their broad ends at the surface of the egg. Most of the food-yolk has disappeared from the other cells, which are now quite transparent, while the cell *α* contains as much food-yolk as ever.
3. As the segmentation proceeds, the flattened area in fig. 2 becomes a deep pit, and a gastrula results as shown in fig. 3. The cell *α* divides in two and becomes pushed into the segmentation cavity. Whether the two cells *α* in fig. 3 represent the whole of the cell *α* in the preceding figure, or whether they are only the inner ends of the same, into which the deutoplasmic elements have withdrawn, and which have then become split off from the outer ends, was not determined. Their further history was not obtained. Brooks inclines to the belief that they represent the inner ends of the cell *α* in fig. 2, and are not mesoblastic, but go to form a food-yolk like the inner ends of the yolk pyramids in centrolecithal eggs.
4. Ventral view of embryo artificially removed from the egg thirty hours after oviposition. *l b*, labrum. *m t*, metastoma. I, first antenna. II, second antenna. III, mandibles. IV, V, VI, buds representing the two pairs of maxillæ and the first pair of maxillipeds of the adult. When the embryo was set free, the body was enveloped in a delicate cuticle, which in the individual figured has been torn off from all the appendages except the first antennæ.
5. First free nauplius stage, about thirty-six hours after oviposition, lateral view. $\frac{8}{1000}$ in. long. The swimming appendages have become segmented, and the rudiment of the abdomen or telson (*ξ*) is apparent. The anus is yet absent. *o c l*, ocellus.
6. Second larval stage, or metanauplius, lateral view. $\frac{9}{1000}$ in. long. *c p*, carapace. *o e s*, œsophagus. *i*, intestine. *l*, yolk-cells around the stomach (*s t*). *n*, sub-œsophageal part of nervous cord. *n'*, supra-œsophageal nerve ganglion. The anus is now present on the ventral side of the terminal portion of the abdomen.
7. Third larval stage, or first protozoëa stage, raised from the stage represented in fig. 6, dorsal view. $\frac{80}{1000}$ in. from tip of rostrum to base of spines on telson. The hind-body is now about as long as the carapace, and is divided into four somites and a long unsegmented portion (*a b*). The four somites (8–11) are those which subsequently bear the third pair of maxillipeds and the three following pairs of legs. A larva was taken from the sea agreeing with this one in size and every respect except that the free segments of the hind body were wanting. It is therefore probable that the larva figured is near the end of the first protozoëa stage. VII, second maxilliped. *r*, rostrum. *h*, heart. The mandibles have become reduced to cutting blades in this stage.
8. Fourth larval stage, or second protozoëa stage, raised from the preceding form, lateral view. $\frac{87}{1000}$ in. from tip of rostrum to fork of telson. *o c*, rudiment of compound eye. *ϑ*, shell gland opening at the base of the first or second maxilla.

9. Mandibles, same stage, seen from below. The right and left mandibles are not symmetrical.
10. First maxilla of left side, same stage, posterior surface.
11. Second maxilla of left side, same stage, posterior surface. *r e*, exopodite or rudimentary scaphognathite.
12. First maxilliped of left side, same stage.
13. Second maxilliped of left side, same stage. Resembles the first maxilliped, but is much smaller.
14. Fifth larval stage, or last protozoëa stage, raised from the preceding stage, ventral view. $\frac{35}{1000}$ in. long. This stage is Dana's genus *Erichthina*. The second antennæ are still the chief organs of locomotion. The hind-body has increased in length, and now consists of nine free somites and an unsegmented posterior portion. The outer edges of the first (8) are marked by enlargements which appear to be rudiments of the third maxillipeds. 12, twelfth somite (counting the first antenna as the appendage of the first somite). This is the posterior thoracic somite, the thirteenth or last thoracic of the typical Decapod, being never developed in *Lucifer*. Following immediately upon the thirteenth somite is the first abdominal (a^1). a^4, fourth abdominal somite. The posterior unsegmented portion represents the fifth and sixth abdominal somites and the telson.
15. Sixth larval stage, or zoëa stage, raised from the preceding stage, ventral side. About $\frac{50}{1000}$ in. long. This stage is comparable, so far as the appendages are concerned, with the Elaphocaris stage of *Sergestes*. The third maxillipeds (VIII) and the four following pairs of thoracic appendages (IX–XII), as well as the swimmerets or appendages of the sixth abdominal somite (XIX), are present in a rudimentary shape as bilobed buds. All the somites of the abdomen are now well marked except the sixth, which is not yet clearly separated from the telson. The somite which carries the last pair of thoracic legs in the typical Decapod is wanting here and throughout the development of *Lucifer*. *n*, abdominal nerve ganglion.
16. Lateral view of the same stage.
17. Seventh larval stage, or first schizopod stage, viewed from below. About $\frac{70}{1000}$ in. long. This stage is Dana's genus *Sceletina*, and represents in a general way the Acanthosoma stage of *Sergestes*. Up to this time the larva has swam chiefly by means of the antennæ. In this stage the antennæ lose their locomotor function, which is now assumed by the long biramous appendages which have developed from the bud-like processes on the thoracic segments of the preceding stage. The compound eyes are mounted upon short stalks. The second antennæ have become quite small. The thoracic appendages (VI–XII) are much alike in structure and with the telson and swimmerets (XIX) serve to propel the animal through the water. The telson is separated from the sixth abdominal somite.
18. Ninth larval stage, or third (last) schizopod stage, lateral view. Between this stage and the one represented by fig. 17 one intervenes similar to fig. 17, but a little larger and furnished with abdominal appendages in the form of small buds. In the stage represented by fig. 18 the abdominal appendages are quite large, but still rudimentary. The abdomen is now very much longer in proportion to the carapace than it was in the zoëa stages, and flattened from side to side. The outer branch of the second antennæ is reduced to a scale.
19. Second and third maxillipeds (VII, VIII) and the four following appendages of the thorax, left side, seen from above, same stage.
20. Young *Lucifer* produced from the moulting of a larva like that shown in fig. 18, lateral view. About $\frac{1}{5}$ in. long. It now corresponds in many respects with the Mastigopus stage of *Sergestes*, and has a form essentially like that of the adult *Lucifer*. The flagellum of the first antenna, however, is much shorter than in the adult, and the neck of the carapace is short. The thorax is relatively smaller than in the last stage. The last pair of thoracic feet (XII in fig. 18) have disappeared, together with the outer branches of all the other thoracic appendages, maxillipeds included. The abdominal appendages have their perfect form. II, inner branch or flagellum of second antenna. II′, outer branch or scale of second antenna. β, auditory organ in proximal segment of first antenna. γ, antennal gland.
21. Inner surface of mandible of adult.
22. Second maxilla of adult. *r i*, inner branch. *r e*, outer branch, or scaphognathite.

PLATE XI.

Development of Decapoda, *continued. Figures from* N. Bobretzky, Walter Faxon, Paul Mayer, Fritz Müller, Carl Claus, *and* Ferd. Richters.

a.	Anus.	*o c.*	Eye.
a b.	Abdomen.	*o c l.*	Ocellus.
b l.	Blastoderm.	*p d.*	Proctodæum, or hind-gut.
b r.	Gill.	*p l.*	Procephalic lobe.
c p.	Carapace.	*p p.*	Protoplasm.
d p.	Deutoplasm.	*p y.*	Yolk pyramid.
e p.	Epiblast.	*r e.*	Exopodite.
g m.	Gastrula mouth.	*r i.*	Endopodite.
h.	Heart.	*s d.*	Stomodæum, or fore-gut.
h y	Hypoblast.	*v m.*	Vitelline membrane.
l b.	Labrum.	*α.*	Tail fold.
m s.	Mesoblast.	*β.*	Epipodite.
m t.	Metastoma.	*γ.*	Antennal gland.
n.	Nerve.	*δ.*	Palpus.
n c.	Nucleus.	*ε.*	Epipodite.

1–9. *Palæmon.* From Bobretzky, КЪ ЭМБРІОЛОГІИ ЧЛЕНИСТОНОГИХЪ. Запис. Кіевскаго Общества Естествоиспытателей, III., Т. IV., V., VI., 1873. [On the Embryology of Arthropods. Mem. Kieff Naturalists' Soc., III., Pl. IV., V., VI., 1873.]

1. Egg undergoing cleavage, superficial view. The cleavage is regular. Whether the first clefts reach the centre of the yolk or not Bobretzky was unable to determine, owing to the imperfection of his sections. At any rate the deutoplasm soon invades the core of the egg to such a degree that the subsequent clefts do not attain to the centre, and the segmentation becomes superficial.
2. Section of later stage of the cleavage. The cleavage products now have the form of long pyramids whose apices are fused in the deutoplasmic mass in the centre of the egg. The clear protoplasm, involving the nuclei, has collected at the bases of the pyramids. Later the boundaries of the pyramids become obliterated, while their protoplasmic bases become separated from the deeper food-yolk and form the cells of a superficial blastoderm.
3. Gastrula stage, superficial view.
4. Gastrula stage, section. *b l*, epiblastic layer. *h y*, hypoblast. *d p*, deutoplasm.
5. Section showing the closure of the blastopore or gastrula mouth. *m s*, mesoblast, originating from the walls of the gastrula cavity.
6. Nauplius stage. *l b*, labrum. *a b*, abdomen. I, first antenna. II, second antenna. III, mandible. *p l*, procephalic lobe.
7. Longitudinal section through nauplius stage. The hypoblast cells have increased and passed into and absorbed the whole yolk, forming a solid mass of hypoblast in which the outlines of the cells are almost obliterated. *p d*, invagination of epiblast which forms the hind-gut. *s d*, invagination of epiblast which forms the fore-gut (œsophagus and stomach). *α*, tail fold, between which and the proctodæum lies the rudimentary abdomen. *l b*, labrum.
8. Superficial ventral view of embryo at a later stage. The maxillæ (IV, V) and maxillipeds (VI, VII, VIII) are seen as bilobed buds. *c p*, fold which forms the carapace. *o c*, eye, formed in the procephalic lobes.
9. Longitudinal section of late stage in the development of the embryo. A portion of the nuclei of the hypoblast cells have migrated to the periphery of the yolk, and the cells have assumed a pyramidal form, similar to the cleavage pyramids in Fig. 2. The protoplasm segregates in the bases of the pyramids, while their apices become lost in the central deutoplasmic mass, in which all trace of nuclei has disappeared. The wall of the mesenteron thus comes to form a single layer of pyramidal cells enclosing, and merging into, a central mass of food-yolk. The protoplasmic ends of the hypoblast pyramids finally separate as cellular layer, which forms the lining of the mid-gut and liver in the adult. Connection is formed first with the proctodæum, or hind-gut, and later with the stomodæum (œsophagus and stomach). The latter connection is not made until all the food-yolk in the mesenteron has been absorbed. *n*, ventral nerve cord ; *n'*, supra-œsophageal nerve ganglion. These originate from the epiblast; the latter from the procephalic lobes. *h*, heart arising in the mesoblastic tissue.

10–14. *Palæmonetes vulgaris.* From Faxon, On the Development of *Palæmonetes vulgaris*, Pl. I., III., IV. Bull. Mus. Comp. Zoöl., V., 1879.

10. First larval (zoëa) stage, ventral view. The three pairs of maxillipeds (VI–VIII) serve as swimming organs. Behind these are the rudiments of the two following pairs (IX, X). The hinder thoracic somites are not distinguishable, while the abdomen has six well-developed somites. Compare with this retardation in the development of the thoracic region (which obtains generally among the higher *Decapoda*) the order of development of the somites in the more primitive *Decapoda* like *Peneus* (Pl. IX.) and *Lucifer* (Pl. X.), in the *Schizopoda* (*Euphausia*, Pl. VIII.), or in *Apus* (Pl. VI.). These show the normal order of appearance of the somites to be a regular sequence from before backwards. The terminal segment of the body, which represents the sixth abdominal somite and the telson, ends in a broad plate instead of a fork like that in the larva of *Peneus* (Pl. IX.). The caudal plate bears seven setæ on each side. The line on the right indicates the natural length of the larva.
11. Fifth larval stage, cephalo-thorax viewed from below. All the thoracic legs are functional excepting the penultimate pair (XII). All of them are two-branched excepting the last pair (XIII).
12. Later larval stage, seen from the side. The last thoracic legs lack exopodites. The telson is separated by a movable joint from the sixth somite of the abdomen.
13. Rostrum of a later stage.
14. Rostrum of adult.

15–20. *Palæmonetes varians*, from fresh water, Italy. From Mayer, Carcinologische Mittheilungen. IX. Die Metamorphosen von *Palæmonetes varians* Leach. Mitth. Zoolog. Station Neapel, II., Taf. X., 1880. This species, which is also found in salt water in Northern Europe, has an abbreviated development compared with *P. vulgaris.* In the first larval stage it is furnished with the full number of functional cephalothoracic appendages, the last three pairs being simple. The first five pairs of abdominal appendages are also present in a rudimentary form.

15. First maxilliped, first larval stage.
16. First maxilliped, third stage.
17. First maxilliped, fifth stage.
18. First cheliped, first stage.
19. First cheliped, third stage.
20. First cheliped, fifth stage.
21. *Palæmon Potiuna*, a fresh-water prawn from Blumenau, Brazil, in the condition in which it leaves the egg. All the appendages, including those of the abdomen, are present, as well as the gills. From a photograph of a drawing by Müller. See Zoolog. Anzeig., III., p. 152, 1880.

22–37. Development of *Loricata* (*Palinurus, Scyllarus*).

22–25. From Claus, Ueber einige Schizopoden und niedere Malacostraken Messina's. Zeitschr. wissensch. Zool., XIII., Taf. XXV., XXVI., 1863.

22. Embryo of *Palinurus vulgaris* before hatching. The body when extended measures about 1½ mm. in length. The last two thoracic and all the abdominal appendages are wanting. *o c l*, ocellus.
23. Young Phyllosoma larva (*Scyllarus ?*) 2 mm. long. The head and thorax now have the characteristic disk-shape of Phyllosoma. The abdomen is reduced to a rudiment, and the last two thoracic somites are no longer distinguishable. The first maxillipeds are wanting in this stage.
24. Older Phyllosoma, 4 mm. long. The first maxillipeds (VI) are sprouting out again, and rudiments of the last two pairs of thoracic appendages (XII, XIII) have appeared. γ, antennal gland. In the head are seen the bilateral diverticula of the stomach, the median cephalic artery, and anteriorly the brain ganglion.
25. Older Phyllosoma, 14 mm. long, 6½ mm. broad. All the thoracic legs are now developed and also the abdominal appendages.

26–37. From Richters, Die Phyllosomen. Zeitschr. wissensch. Zool., XXIII., Taf. XXXI., XXXII., 1873.

26. Mandible of Phyllosoma (larva of *Palinurus*).
27. Mandible of a *Palinurus* 25 mm. long. δ, palpus.
28. First maxilla of Phyllosoma.
29. First maxilla of a *Palinurus* 25 mm. long. δ, palpus.
30. Second maxilla of Phyllosoma. *r e*, scaphognathite.
31. Second maxilla of a *Palinurus*, 25 mm. long.
32. First maxilliped of Phyllosoma. *r e*, exopodite. ε, epipodite.
33. First maxilliped of a *Palinurus* 25 mm. long.
34. Abdominal appendage of Phyllosoma.
35. Abdominal appendage of a young *Palinurus.*
36. Telson and last pair of abdominal appendages of Phyllosoma.
37. Telson and last pair of abdominal appendages of a young *Palinurus* 25 mm. long.

PLATE XII.

Development of DECAPODA, *continued.* *Figures from* T. H. HUXLEY, N. BOBRETZKY, HEINRICH REICHENBACH, HEINRICH RATHKE, WALTER FAXON, WILLIAM STIMPSON, ALEXANDER AGASSIZ, *and* PAUL MAYER.

a.	Anus.	*p l.*	Procephalic lobe.
a b.	Abdomen.	*r e.*	External branch of appendage.
b r.	Gill.	*r i.*	Internal " "
c p.	Carapace.	*s d.*	Stomodæum, or fore-gut.
e p.	Epiblast.	*s p.*	Spine.
d p.	Deutoplasm.	*v.*	Yolk.
g m.	Gastrula mouth.	*v m.*	Vitelline membrane.
h.	Heart.	α.	Epithelium of ovisac.
h y.	Hypoblast.	β.	Membrana propria.
l b.	Labrum.	γ.	Stalk of ovisac.
m.	Mouth.	δ.	Basal portion of abdominal appendage.
m e.	Mesenteron, or mid-gut.	ε.	Inner branch " "
m s.	Mesoblast.	ζ.	Outer " " "
n.	Ventral nerve cord.	η.	Egg-case.
n'.	Supra-œsophageal nerve ganglion.	ϑ.	Median spine.
n c.	Nucleus.	ι.	Lateral spine.
o c.	Eye.	μ.	Mesoblast cell splitting off from hypoblast cell.
p d.	Proctodæum, or hind-gut.		

The Roman numerals denote the appendages in their consecutive order.

1 – 10. Development of *Astacus.*

1 – 3. From Huxley, The Crayfish, London and New York, 1880.

1. Spermatozoön of *Astacus fluviatilis* developing in a seminal cell. × 850.

2. Mature spermatozoön of the same, viewed *en face.*

3. Two-thirds grown egg of the same, contained in its ovisac. α, epithelium of ovisac. β, membrana propria, or structureless membrane investing the ovisac. *v m*, vitelline membrane. *v*, yolk. *n c*, germinative vesicle containing germinative spots. γ, stalk of ovisac.

4 – 7. From Bobretzky, КЪ ЭМБРІОЛОГІИ ЧЛЕНИСТОНОГИХЪ. Зап. Кіев. Об. Ест., III., Т. I., 1873. [On the Embryology of Arthropods, Mem. Kieff Naturalists' Soc., III., Pl. I., 1873.]

4. Portion of egg of *Astacus* in the gastrula stage. *d p*, food-yolk. *g m*, gastrula mouth. *e p*, epiblast. *h y*, hypoblast. *m s*, mesoblast.

5. Smaller portion of the same, more highly magnified, to show the origin of the mesoblast cells. μ, mesoblast cell splitting off from one of the hypoblast cells at the mouth of the gastrula cavity.

NOTE. — According to Reichenbach there are formed later, during the nauplius stage of the embryo, secondary mesoblast cells by a sort of endogenous formation within the hypoblast cells on the ventral side of the embryo. These cells wander out from the hypoblast, spread under the epiblast, and mingle with the primary mesoblast cells.

6. Later stage of the same. The gastrula mouth has closed, and the gastrula cavity has become the mesenteron (*m e*). *a b*, abdomen. *p d*, proctodæum, or hind-gut. *s d*, stomodæum, or fore-gut.

7. Later stage of the same. The hypoblast cells have absorbed the whole yolk, and assumed the form of long pyramids, enclosing the cavity of the mesenteron. The bases of these pyramids are directed outward, and contain the nuclei and protoplasmic portion of the cells. The protoplasmic bases of the pyramids then separate from the deeper portions to form the epithelial lining of the mid-gut of the adult (liver and anterior portion of the intestine). The inner portion of the pyramids becomes food-yolk in the cavity of the mesenteron. In the stage represented, the fore-gut (œsophagus and stomach) and hind-gut (posterior part of the intestine) have not yet opened into the mid-gut. *h*, heart, formed in the mesoblastic tissue. *n'*, *n*, supra- and sub-œsophageal portions of nervous system, formed from the epiblastic germ-layer. *c p*, fold which forms the carapace.

8. Nauplius stage of the embryo of *Astacus fluviatilis.* I, first antenna. II, second antenna. III, mandible. *l b*, labrum. *a*, anus. *c p*, carapace. *p l*, procephalic lobes. *o c*, optic pit, epiblastic invagination in the procephalic lobes concerned in the formation of the supra-œsophageal ganglion and nervous elements of the eye. *h*, heart. From Reichenbach, Die Embryonalanlage und erste Entwicklung des Flusskrebses. Zeitschr. wissensch. Zool., XXIX., Taf. X. fig. 8, 1877.