Anatomy of Serpentaria, Nemertes, and Forbesia, by Harry D S Goodsir.
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Transcribed by Jill Walthew, 7 June 2026.

Transcription marks and colours:
[del] - text crossed out (unknown whether by HDSG or JG or both)
[ss] – superscript added
[illeg] – illegible
[?] – unclear, my guess based on context
Blue text: John Goodsir's amends/additions
Red text: section scored out (unknown whether by HDSG or JG or both)

All spelling and grammar as in original. Paragraph breaks are mine. He uses two dots or lines for line breaks in words, as was common at the time. The pages are numbered, presumably by the author.

Any mistakes are mine!

Archaic or unusual words used:
Page 2: rostrum: in this sense, a proboscis of sorts; the word used now is rostellum
Page 4: insuetude: not being used (only appearance of word in OED is from 1828 and this is the same meaning)
Page 6: rete mucosum: top layers of skin eg epidermis; commonly used at the time
Page 8: sutural: of a join between plates, rings etc; this is the specific zoological meaning, I added it here because a search usually only throws up the medical meaning
Page 19.1: blastema: mass of cells that forms the basis of a new limb or part in animals that regenerate them
Page 23: line (old unit of measurement) – about 2.11mm
Page 24: mesentary: in invertebrates, a membrane providing support within a body cavity
Page 25: Valvulae conniventes [sic] – mucosal folds in the small intestine

Page 1
The Anatomy [del] , Physiology and Natural History] of Serpentaria, Nemertes, and Forbesia. By Harry D.S. Goodsir. Afsistant Surgeon HM-Arctic exploring ship Erebus

The [del: organic] structure of the two first of these animals is very simple but at the same time peculiar, and exceedingly interesting. The observations made on them have enabled me to make out more fully than has [ss: yet] been [del: heretofore] done the [del: comparative] anatomy [del: and physiology] of the Nemertoid worms to which they both belong. I have also [del: been led to make out] [ss: succeeded in collating] several important points [del: relative to the functions of] [ss: regarding] those organs which have the power of reproducing lost parts. In the former animal this power seems to exist as a natural [del: means] [ss: mode] of propagating the species as well as by the ordinary procefs of generation.

Before proceeding to describe something of Serpentaria [del: it will be well to] [ss: I shall] prefix a short account of its external characters + Natural History

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The most complete of three specimens which I have been enabled to procure of Serpentaria* measured almost two feet in length when fully extended about half an inch or a little more in breadth It was broadest for the extent of three [del: to] [ss: or] from the rostrum backwards which part generally appeared to be dilated. The anterior extremity ended in a finely pointed rostrum having two very narrow longitudinal slits, of a sigmoid shape, on each side. – the apertures of the male organs – [ss: a large opening existed] behind and below these on the abdominal surface [del: is a large opening] the aperture of the common central cavity. The body was of a bright clay blue colour with the exception of [del: two] a narrow strip of a yellow colour running down each side of the body. The external surface was slimy and when the animal was taken in the hand it had a gelatinous consistency.

When the body was laid open by means of an incision carried from the abdominal aperture to the posterior extremity [del: of the body] the follow:

[in pencil] *See Annals + Mag: of Nat. Hist. *[Transcriber's note: this would refer to the article on gigantic invertebrates published in the June 1845 issue of the magazine, which covers these animals in less detail]*

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:ing appearances were seen. – All that portion of the body which was dilated consisted of a continuous cavity having the living membrane [?strong] very much corrugated and covered with mucus. At the posterior part of the cavity the membrane was reflected and projected into the cavity again in the form of a cone. the abdominal surface of which was firmly attached to the inferior surface of the cavity. When therefore the incision was carried along the abdominal surface of the body, this conical projection was cut through along with the integuments and the interior portion of the ovary displayed lying free within it. The incision being produced still farther, this anterior portion of the ovary [del: is] [ss: was] perceived sending off two large bundles, one for each side of the body. These two bundles as they ran back from reduplications, each reduplication proceeding towards the side of the body where is is confirmed within the sept[del: a]um formed by the living membrane of the body. The

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intestinal canal is almost obsolete but exists as a delicate filament which runs immediately without and above the common central cavity, that, upon its dorsal wall. The internal male organs consist of two delicate narrow cords which run along [del: on] each side of the common cavity, external to the living membrane and proceeding from the external apertures at the rostrum to the posterior part of the continuous portion of the common cavity and perhaps a little beyond; farther than this it is not easily seen being obsolete owing to its insuetude. The integument is very thin but consists of three layers. A layer of strong [? fiber] muscular fibres may be seen lying within the integument + below that the lining [del: of] membrane of the common cavity. The true muscular system consists of the two longitudinal bundles of fibres which are situated on either side of the body.

The structures here

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noticed for the sake of convenience may be clafsified from the skin inwards

- Integument. consisting of three layers
- Muscular Apparatus. – consisting of the two long muscular bands on either side of the body, and the circular form of fibres lying within the integument.

- Digestive Apparatus. – . consisting of the proboscis, intestinal canal.
- Biliary Apparatus.
- Generative Apparatus. – Testes, external apertures. – Ovaries.
- Reproduction of lost parts.
- Respiratory Apparatus.
- Common central cavity.
- Organ of touch.

Integument

The integument in this animal consists of three layers the Cuticle, rete mucosum, and cutis – The Cuticle is when examined under the microscope composed of numerous small delicate fibres interwoven in and obscure manner with one another the interstices being

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filled up with a great quantity of thickish more adhesive matter apparently homogeneous – probably mucus and perhaps the source from which the cuticular mucus is supplied. This layer of skin is quite black. The rete mucosum consists of numerous fibres similar to those of the cuticle but much more numerous and apparent. When examined closely the fibres appeared to be interwoven in a manner similar to those of a piece of cotton cloth. The internal layer of the skin is of a similar structure + fibres run from it into the annular layer of connection. The skin can be easily separated from the inclosed muscular tifsues + when carefully examined under such circumstances is found to pofsefs several [del: peculiar] [ss: curious] properties, amongst which the most peculiar is its elasticity this property appears to be increased after the animal has been some time left in spirit.

The structure immediately

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within the skin is muscular, which consists of two sets – an annular or that surrounding the annuli and a longitudinal. The former may be looked on as a contractor the latter as an extensor + flexor. The annular set of muscles consists of a series of fasciculi of parallel fibres [del: illeg.] one or more fasciculi belonging to each segment.

The longitudinal set of muscles consist of a thick fasciculi of longitudinal fibres running up each edge of the body. Both of these [del: layers] [ss: sets] of muscles however are lost on the continuous portion of the common cavity as will be described immediately. The description of the skin as [del: l] already given, only refers to the annular or divided portion of the body; in the anterior [? or] continuous portion of the body its structure is very different. When a transverse section of this annulus is made; for I look upon it as only one seg:

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:ment developed to the length of several inches, [del: illeg] [ss: no] distinct division between the skin + muscle is observable or rather the muscular structure us lost + its place affirmed by a semicartilaginous [ss: structure] of a whitish yellow colour and great thicknefs being more than the eighth of an inch thick; it is not fibrous but has [del: more] the appearance presented by the sutural surfaces of the separable annuli which we shall now describe. This appearance [del: now to be described] is not similar to any other in the animals body, but is apparently an adaptation only, of the structures already described, to the peculiar function performed – viz. that of separation. – If the sutural surface of a newly separated segment be examined, it will be perceived, even with the naked eye, that instead of being an irregular undetermined surface, as if caused by forces

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it is perfectly regular + presents the appearance of a number of regularly arranged parallel fibres of considerable thicknefs. + having their long axes directed from within outwards. In this direction they only extend from the external surface of the living membrane to the internal surface of the skin; they are rather thick the bases of all of them meeting so that from this circumstance there are an equal number of hollow spaces almost of the same size as [ss: the] projecting fibres. These hollow are for the purpose of receiving the projecting fibres of the [del: attached] [ss: proximal] annulus and vice versa.

The next tifsue to be described belonging to this series, is the living membrane of the internal cavity of the body. This is very similar in its microscopic structure to the skin*, + is composed of a great number of fibres interwoven with one another at

[in pencil] * It was at one time supposed to be a layer of the skin

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right angles, the one series being as usual, larger than the other.

This membrane may be traced, in continuation with the skin, from the abdominal aperture backwards throughout the whole of the internal cavity; in the continuous portion it is thick + corrugated on its internal surface, and its external closely applied to the thickened integument; as it pafses out of this continuous portion of the cavity, so named from having none of the septa which occur in the annular, it is reflected forwards in the form of a cone the base of which is attached all round with the exception of a small foramen of communication between the two divisions After this it pafses back each annulus being completely lined with it excepting the foramen of communication which ex:

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:tends throughout the whole length of the body; at each suture a fold [del: of the] extends into the centre of the cavity from each side so as to form a series of septa at regular intervals [del: from each side of the body.] These septa are double on account of a fold coming off from each segment.

The Digestive system.

The intestinal canal of Serpentaria appears to be almost uselefs, as a means of supplying nourishment to the animal, on account of its insignificant size. The proboscis is obsolete but the orifice for its protrusion is visible at the extremity of the rostrum, the cavity also for its reception during the time it is retracted is easily seen when a longitudinal section is made through the mæsial line of the rostrum.

From the proboscis being generally in a retracted state also from several other circumstances the proboscidean cavity has been mistaken by several

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observers for a ganglionic brain from analogy however it can be decidedly proved to be otherwise; [del: from] a small delicate filament is very easily observed with the naked eye proceeding from the posterior part of the cavity [del: and] which running back [pencil mark |] is lost among the integuments [pencil mark ||] gradually becomes smaller + smaller until it [pencil mark |]** There

did not appear to be any cavity in this abortive organ which [ss: fact] would lead us to suspect its connection with the digestive apparatus. There is no doubt however that it is analogous to the [del: wider] intestine of Nemertes, which will be described shortly, seeing that it holds in all respects exactly the same relations. This digestive canal then [del: it will be seen] is quite abortive and unfitted for the purposes of nourishment [del: for which reason then] [ss: on which account] the common cavity in all probability

***[Transcriber's note: this appears to be instructions for reordering the sentence so it reads: "...which running back gradually becomes smaller + smaller until it is lost among the integuments"*

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afsumes the characters of a digestive canal, for the performance of the functions of which it is quite fitted from its relations and structures

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Generative System

The organs of generation in this animal are more highly developed than any other the other organs and they afford many interesting

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facts relative to the physiology of generation. Both sexes are combined The male organs consist of a [del: narrow] slender filament on each side of the body, which runs from the narrow sigmoid slits on each side of the rostrum to a little beyond the continuous portion of the central common cavity, where they gradually become smaller and cannot be observed unlefs a transverse section is made when they are seen, immediately without + on either side of the ovaries, as a small darkish spot. When a small longitudinal portion of this is cut out and placed under the microscope a great number of large transverse oval cells are seen extending acrofs the cavity of the tube [del: with] [ss: containing] a number of small sphericlal [sic] cells arranged in regular rows around the centre. within these smaller cells are seen which contain the Spermatozoa The spermatic fluid escapes from

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the sigmoid slit + impregnates the ova as the are expelled from the common abdominal aperture.

Several authors have from want of observation mistaken the[del: se] testes in the [? el]

When a small longitudinal portion of this is cut and placed under the microscope it is found to be tubular the cavity containing numerous cells of a considerable size within [? whch] are two series of smaller cells the last series being the Spermatozoal. The spermatic fluid escapes from the sigmoid slits + impregnates the ova as they ifsue from the abdominal aperture.

The female organs of this animal are very extensive stretching from the posterior part of the continuous portion of the common cavity [ss: to] the extremity of the body. When the body has been laid open by means of an abdominal inscision [sic] the

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anterior extremity of the [del: body] ovary is seen lying in the reflected conical shaped fold of the lining membrane as already described. This portion of the organ is about half an inch in length is of a quadrate shape and has the anterior extremity quite free. It afsumes the quadrate form in consequence of its being divided into four parts by means of as many [del: four] longitudinal furrows Two of these divisions run to each side of the body constituting the lateral portions of the ovary; at first when just separated the divisions are very small and the lateral branches sent off minute but it speedily increased in size, so instead of sending off as it did at first small branches [del: it be] into each of the compartments formed by the septa of the lining membrane, it simply curves around the internal free edge of the septum + after [del: dif] coursing around the [del: cavity formed by two septa] [ss: compartment] [del: left] [ss: leaves] it to run into the succeeding in the same

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way. When a small portion of the anterior part of the ovary is placed under the microscope it presents a striated appearance, which arises from this portion of the ovary – that from which [del: two] [ss: true] ova are developed being composed of a series of longitudinal bands, each of these bands [del: is] con[del: sists of] [ss:taining] numerous small cells, germs [ss: of ova], + several in a state of activity [del: may be {ss and del: were} seen also] very considerably advanced. This peculiar appearance is not observed in the posterior parts of the organ, extending only as far back as the active portion of the testicle.

Reproduction of lost parts

[del: As already described] [ss: The body of] Serpentaria is divided into two parts – the first or continuous, which as already described is but one annulus, and the second or annular which

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consists of [ss: new {illeg}] many segments conjoined with one another.* Each of these segments is about the 1/8th or rather lefs, [del: than] of an inch in length + when the animal is irritated or alarmed it throws off, without any apparent effort or pain one or more [del: of these] either conjoined or separate. It may do this in all probability to enable it to escape from the cause of irritation or alarm + the way in which it is done can be very easily conceived. The sutural structure has been already described + when the animal wills, the comprefsion + flexing + extending muscles are all made to act simultaneously which causes separation to take place.

Shortly after this has been effected the [ss: latural {sic}] portions of ovary which are now terminal begin to take on a new action, the cells becoming active +throwing off young within them cause the recently made extremities to bulge [del: out] + project out from

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the [ss: central] opening – what [del: was the central] [ss: is now the] termination of the common cavity [del: before the separation] This bulging very shortly becomes covered with integument + only requires to increase in size to make it similar to the rest of the body,* *[transcriber's note: see note for 20.1 on last page]*

the portions of the body however which are thrown off also become independant [sic] animals by a similar mode of development, each segment having [del: all the elements of] all the organs in an elementary state.

Respiration

This may be effected from two sources namely the, skin, and the central common cavity.

Central cavity of Body

Appears to be common to the performance of digestions, generation, + respiration. As regards the per:

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:formance of respiration + the functions fulfilled by the common central cavity, they are alike similar in both [del: animals] Serpentaria and Nemertes.

Nemertes*

This animal has been long known but its structure and physiology is completely misunderstood. Owing to the afsistance derived from the comparison of its structure with that of the former species I have been enabled to make out satisfactorily, I hope, the anatomy of both. The internal structure of this species is so similar to that of Serpentaria in the general points of its structure that it will be needlefs to enter into details regarding them, but before commencing the more special description of the parts I would just mention that in external appearance it differs inasmuch

*See Annals + Mag: of Nat: Hist: *[Transcriber's note: this would refer to the article on gigantic invertebrates published in the June 1845 issue of the magazine, which covers these animals in less detail]*

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as it is quite cylindrical throughout its whole extent, about several feet in length, + of a dark green colour

Integument

The external covering of Nemertes in all is more special characters is exactly similar to that of Serpentaria with the exception of the elasticity describe as existing in that of Serpentaria which property [del: this] it almost altogether awanting.

Muscular Apparatus

The lateral longitudinal muscles which act in Serpentaria as extensors + flexors of the body are entirely awanting in Nemertes The annular series however are easily observable + on examination are found to be exactly

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similar with the exception of the muscular fibre being weaker the whole structure apparently acting more as an organ of defense than in any other capacity.*

Digestive System

The organs of Digestion of Nemertes are much more highly developed than those of Serpentaria + so much so as apparently to require no afsistant organ [ss: or substitute] as in Serpentaria altho in all probability the common cavity acts as a digestive organ also. The true digestive canal in this species may be divided into three parts, the proboscidean, the stomachal, and the intestinal, The first of these is about an inch in length, and trumpet shaped; its diameter is about the 1/4th of a line except at the extremity which [del: at its greatest] may be about a line in diameter

*The lining membrane of the central cavity is in every respect similar to that of Serpentaria [del: with the exception of] [ss: excepting] the reflect[del: ed] [ss: ion] [del: portion] at the posterior foor of the continuous portion of the canal which is wanting being only slightly contracted

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All that portion which runs along the dorsal surface of the continuous part of the common canal I term the stomachal, it is quite straight, and completely surrounded with the integument. The succeeding or intestinal portion of the canal commences so soon as it ifsues from the integument upon which it very shortly dilates very much + is tied down and puckered up at intervals by means of a fibrous band analogous to a mesentery – which surrounds it + binds it down. This band can be easily unwound upon which the intestinal canal can be extended to its full length. When a small portion of this canal is cut out + laid open so as to display the internal surface, it exhibits with a slight magnify

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:ing power a number of folds in the mucus membranes somewhat similar to the valvulae coniventes in the ileum of the higher animals.

Generative System

The organs of generation are much more highly developed in this animal than in Serpentaria + as in the animal just named both sexes are combined in the same individual. The organs also are arranged, + hold the same relations to one another; the testes consisting of a long slender filamentary tube running along each side of the body from the sigmoid slit on each side of the rostrum [del: to the pos] as far back as the posterior extremity of the ovaries. When a small portion is

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cut out and placed under the microscope its minute structure is found to be similar to that of Serpentaria but on a larger scale; The primary cells are very large of an oval shape + placed transversly [sic] across the tube, the secondary cells being [del: arranged] globular and arranged in concentric layers, the spermatozoal cells are seen also within the secondaries. The walls of the tube are rather thick + composed of cellular tifsue.

The ovaries do not rise from a common point but lie on each side of the continuous part of the common canal to the lining membrane of which they are attached by means of a delicate membrane, at this part

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they are three sided and of considerable size being about a line in diameter; upon leaving this part of the canal they become irregular dipping into the lateral compartment formed by the septa of the lining membrane. When a small portion of the anterior part of the ovary is examined under the [del: ovary] microscope the cells are all minute and inactive, but when the posterior part is examined in the same way great numbers of cells are seen in a state of activity and many ready to be thrown off as ova. The ova are impregnated as they pafs out of the common aperture the spermatic fluid pafsing simultaneously from the sigmoid slits on each side of the rostrum.

The power of separation

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not being highly developed in this animal we consequently do not find the reproductive organs**. I could not make them out but in all probability they exist to a certain extent as the power of separation is [ss: not lost altogether but] only very much limited.

There are several very interesting points in the [ss: comparative] Anatomy and Physiology of these two animals to which I would now advert, + these more particularly refer to the organs of Generation + Reproduction.

Serpentaria affords a very beautiful instance, in the higher clafses of invertebrate animals, of fifsiparous generation, and as in some of the higher forms of Annelida combined with the ordinary procefs of generation [del: Upon this depends the peculiarities in the organs of generation] It will be recollected that the

***Transcriber's note: this seems to mean the 'reproduction of lost parts' as with Serpentaria.*

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There are several very interesting points in the [ss: comparative] Anatomy and Physiology of these two animals to which I would now advert and first with regard to the opinions of some Authors relative to the organs + their uses.

Rathke, supported more lately by Quatrefages looks upon the proboscidean cavity as a ganglionic brain sending off, according to the former, branches to the sigmoid slits on each side of the rostrum, from this circumstance he conceives these slits to be delicate organs of touch. The latter Author goes still further in his opinions regarding the development of the nervous system of these animals; He looks upon filamentary male organs which run down each side of the body as nervous cords proceeding from the ganglionic brain; so far however as my observations went they could be traced no nearer this supposed brain than

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the slight curve which they took in their course towards the rostral apertures. The appearance certainly which this part presents when a section is made of it, and especially, when the proboscis is retracted, or in those species where that organ is abortive, is sufficiently like that of a ganglion to induce a mistake + so much is this the case that it appears to me a proper knowledge of its right structure could only be arrived at from analogy. In Serpentaria a section of it gives an exact representation of the structure of a ganglion and the abortive intestinal canal proceeding from its posterior part that of a nervous filament. In Nemertes this is corrected from the proboscis being so large and distinct as to enable it to be traced into the cavity and from thence into the intestinal canal posteriorly. [del: This intestinal canal]

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The filaments which rune [del: down] up each side of the body do not proceed there from the so called ganglion. but their minute structure, were there any doubt about the connection, should be sufficient to decide at once their true nature

Serpentaria like some of the higher forms of Annelida affords a very beautiful instance of fifsiparous generation combined with [del: the ordinary pro] an organisation for the ordinary procefses of ovarian generation.

It will be recollected that this animal is divided into two parts, an anterior consisting if one annulus enormously enlarged, and a posterior composed of numerous annuli attached to one another. Each of these annuli contains in itself all the elements of the perfect [del: animal] [ss: being], so that we may look on Serpentaria as a composite animal, a fact peculiarly interesting when it is recollected that in all

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animals having a similar power a like organisation exists

It is only in the posterior part of the body that this power of separation exists the animal being enabled to throw off as as already been described one or more segments, singly or conjoined; And it has been endowed with this power for two reasons.

[del: 1st It has been enabled to do so]
1st To enable it to escape from its enemies, which it could not otherwise do [del: illeg.] owing to its comparative unwieldinefs.
2nd. As a means of propagation of the species.

Upon these then depends all the peculiarities existing in the structure + functions of the generative system of this animal. The Testes are divided into two portions

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an active and inactive – the former being anterior the latter posterior. The ovaries are also divided in the same way but in this case the posterior divisions are only inactive as regards the development of ova; Cells are without doubt being constantly formed but not active as formative cells only afsume this character when the portion of body containing it is thrown off or when it becomes the terminal for the purpose of reproducing, [ss: the first part] along with the afsistance of the special organ, [del: the lost parts.]

The lost parts in all probability might be reproduced through the agency of true ovarian cells as well as by means of formative cells for in all these lower animals no apparent difference exists in the structure or functions of the two forms of cells. But how

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ever this may be when the ovary of Serpentaria is examined by means of the microscope a small portion of the anterior part only is found with active ova in it + this portion is that contained in the [ss: half of the] body which does not divide spontaneously, the rest all containing cells which are in a state of inactivity.

From the above circumstances I have been led to suppose that the posterior part of the body being so constantly liable to division were ova thrown off they would escape from the body by means of the opening caused by the spontaneous division, instead of the natural abdominal structure + so escape impregnation. This posterior part of the organ therefore is devoted to the reproducing of lost parts and the anterior to

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generation of young by means of true ova.

The structure + functions of Nemertes is brought out from the anatomy of Serpentaria and at the same time afsists [del: us] very much in [del: the] proof of the facts above stated if any further proof is required than what has been already deduced from the comparative structure of the animal itself.

In Nemertes we have [del: exactly the reverse the functions] the order [del: in] in which the functions of these organs are performed almost exactly reversed. The testes extend [del: throughout the] as far back as the posterior part of the ovaries and are active throughout their whole extent. The ova instead of being active anteriorly as in Serpen:

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:taria are only found in the posterior extremities. – (the ovaries growing from before backwards as in Caligidae and some of the other Crustacea) – which is to be accounted for from the power of division being limited or absent* [del: owing] consequently there is no danger of the ova escaping from the body without being impregnated

*I have seen the fishermen disentangle the whole length of this worm from their lines without breaking a single annulus. Serpentaria cannot be touched without throwing off portions of its body.

ENDS
(Transcriber's note: the possible end of this section and next section on Forbesia are missing, they may have become separated and be in another folder, or my no longer exist in manuscript form)

Additions/footnotes/appendices – these are written on separate sheets, presumably after the main paper, and are numbered with the page to which they refer and a 1.

Page 18.1 *(separate sheet; appears to be an extension of the Organs of Reproduction section. Handwriting messier, as if written in a hurry)*
The organs of reproduction [del: can] are situated between each segment dipping down between each of the reduplications formed by the ovary; they consist of a series of [del: ridges] transverse parallel ridges which are firmly attached to the [del: lin] inner surface of the living membrane of the cavity at regular intervals. When a thin longitudinal section of the cavity wall of the animal is made, including the lining membrane, and placed under the microscope it will be found to present the following appearances.

In this section is is supposed that the ridges are attached.

1st the cavitay [sic] wall consisting of a series of sigmoidal curved fibres in irregular fasciculi + irregularly interwoven with one another. A double series of other fibres proceed from the internal surface of the [illeg] membrane [ss and del: at regular intervals]

Page 19.1 (separate sheet for footnote to p19)
*both of which curve inwards and meet one another at their extremities, in this way is the ridge formed + in a longitudinal section these ridges may be seen, at regular intervals from one another, all composed in the same way. A cavity therefore is formed within each ridge in which the reproductive [del: cells are arranged] blastema is arranged

Page 20.1 (separate sheet for footnote to p20)
*this would appear to be effected by means of the blastema [del: which is laid open in the] enclosed in each ridge as described and which is laid open upon the separation of the segments. Before the separation took place the cells were in a state of inactivity but so soon as exposed they become active as formative cells.