THE CONSTITUENTS OF THE HYPOGASTRIC NERVES.

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IN the course of our observations upon reflex action from sympathetic ganglia[1] we had occasion to cut in the cat, at times one of the hypogastric nerves, at times some of the nerves connected with them, and to observe the physiological results of the sections after sufficient time had elapsed for the cut fibres to degenerate. The physiological results we have already given (*op. cit.*). We give here the histological results. These obviously afford a means of testing our conclusions with regard to the course and nature of the nerve-fibres which bring about the sympathetic reflexes.

The chief point which concerned us was the relative number of normal and of degenerated medullated fibres in the hypogastric in various conditions. To render the medullated fibres distinct, the nerves were treated in the usual way with osmic acid ·5 to 1 p.c. We have generally placed the nerves, fastened at the ends to keep them straight, in 1 p.c. osmic acid for about 16 hours, and then washed them for several hours in a stream of water. After this treatment, pieces of the nerves, about 3 mm. in length, may be teased out at once in glycerine, but the connective tissue is apt to be a little sticky, and it is better to place them for a day in 70 p.c. alcohol before teasing. Further delay is not advisable, for in alcohol the non-medullated fibres soon take a brownish tinge which makes it extremely difficult to distinguish the finer medullated fibres; moreover, the fibres gradually become brittle. When delay is unavoidable, it is best, so far as our experience goes, to preserve the nerves in a mixture of equal parts of absolute alcohol and

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[1] This *Journal,* XVI. 410, 1894.

glycerine; in this, the non-medullated fibres take a yellowish tint. In order to count the fibres, the piece of nerve taken, should be separated into the finest possible filaments, for many of the fibres have so scanty a coat of medulla that they are easily overlooked. The counting is perhaps best done under the full light of the condenser, the diaphragm being removed.

The enumeration of medullated fibres in a normal nerve is much easier in a transverse section than in a teased specimen, but this method was rarely applicable to our cases. Often we had stimulated the nerves we examined; this, and the inevitable slight soaking in blood, tend to make the smaller nerve-fibres varicose. And as a rule the nerves contained degenerating as well as normal fibres; in a cross section many degenerating fibres escape notice, and some have the appearance of normal fibres.

In teased specimens, a difficulty in enumerating the normal and degenerated fibres arises from the different rates at which the medulla breaks up in the different fibres. In five days, some fibres still show considerable stretches of unbroken medulla. In ten days, when the medulla of all the fibres has been broken up, a considerable number of the small fibres show a few droplets only of myelin, and it is to be presumed that the fatty staining constituent has completely disappeared from others. For this reason, and because we were not always able to tease out the nerves at once, we regard many of the enumerations we give as approximate only, but in view of the variations which occur in individual animals, we do not think that this affects our general conclusions. We may point out that all our observations have been made on the cat.

Constituents of the normal hypogastric nerves. The greater part of the hypogastric consists of non-medullated fibres. These run in broadish bands, but the bands are easily teased into minute fibrils. Occasionally on the course of the undivided hypogastric, and most frequently near the inferior mesenteric ganglion, there are a few nerve cells. The *number* of medullated fibres varies considerably in different animals; and it is usually, at any rate, not the same in the two hypogastrics. We have mentioned earlier (*op. cit.*), that the right hypogastric is commonly though not always larger than the left; and in most of our cases the medullated fibres were more numerous in the right than in the left hypogastric. We give in the following Table the numbers we have found.

			Right hypogastric	Left hypogastric
No. 1.	Medium size	6μ	2	1
	adult female	5μ	2	2
		1·3 to 4μ	562	393
			566	396
No. 10.	Medium size	9μ	1	0
	adult female	about 7μ	3	2
		about 4μ	73	37
		1·3 to 3μ	577	365
			654	404
No. 2.	Large	about 6μ	1	1
	adult female	1·3 to 4μ	911	737
			912	738
No. 11.	Large	5μ	1	—
	adult female	1·3 to 4μ	917	—
			918	

In No. 6 the fibres in the right hypogastric were counted, but less carefully, there were about 470, of which 1 was large.

We have compared under the microscope the general appearance of these nerves with that of others, and we think that No. 1 represents nearly the minimum number of medullated fibres in the hypogastrics, and that No. 2 represents about the maximum number, that is, we take 350 to be about the minimum number of medullated fibres normally present in either hypogastric and 900 to be about the maximum number. In the two hypogastrics taken together, the number varies from about 950 to about 1650.

There are one or two points to be noticed with regard to the character and size of the medullated fibres. There are a considerable number of very small fibres, about 1·3 to 1·5μ in diameter, and with very inconspicuous medulla. These are smaller than most of the fibres of the cervical sympathetic or of the nervus erigens. There are a certain number of larger fibres, but in which the medulla takes a very faint tinge with osmic acid. Numerous fibres of all sizes from 1·5 to 3·5μ are present; and there are a not inconsiderable number from 3·5 to about 4μ; the latter fibres differ strikingly in appearance from the smallest fibres, but we are doubtful whether they should be classed with the rather larger fibres of about 5μ in diameter (medium sized sympa-

thetic fibres), or with the rather smaller ones of about 3μ. The medium sized fibres (about 5μ) are few, and variable in number. The large sympathetic fibres (about 8μ) are not infrequently absent, but sometimes one and sometimes two occur. The absence of such fibres is important since it helps to show that some fibres of less diameter are afferent sensory fibres. The hypogastric is very generally credited with possessing sensory fibres which give rise to pain. In all the cases in which we tested the matter, we found that stimulation of the central end of the hypogastric was capable of giving rise to body reflexes, like those which in unanæsthetized animals are accompanied by pain. We conclude then that the large medullated fibres of the sympathetic are not the only afferent fibres which are sensory; a conclusion which has already been urged by one of us[1]. In the cat, the large sympathetic fibres run chiefly, and perhaps entirely to the Pacinian bodies in the mesentery; that these also are sensory is probable on various grounds; thus we may mention that there is much more pronounced reflex body-movement on stimulating the spinal branches to the inferior mesenteric ganglion, which contain these large fibres, than on stimulating the hypogastrics or other strands running from the ganglion and which contain few or no large fibres.

Ascending fibres from sacral nerves. We have one case only (No. 3) in which all the spinal nerves giving branches to the nervus erigens, were severed. In this, the lower part of the spinal cord and the cauda equina were removed, the roots of the vith and viith lumbar nerves being cut, the sacral nerves being severed peripherally of the posterior root ganglia. The animal was killed after 9 days. The pelvic plexus and the hypogastric nerve on the left side were examined. In the nervus erigens all the fibres were apparently degenerated, but there were 9 very small fibres, with indistinct medulla, which may possibly have been sound. From the nervus erigens degenerated fibres could be readily followed over the whole plexus and into the bladder, the prostate and other organs. The hypogastric at its lower end, divided into three strands joining the pelvic plexus. About four millimetres below the point of division these strands contained 58 degenerated fibres ($13 + 36 + 9$). Just above the point of division of the hypogastric, there were four to five dozen degenerated fibres, some of which could be seen to turn round and take a recurrent course. Above this spot the number of degenerated fibres rapidly diminished; thus about one

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[1] Langley. *Phil. Trans.* 1892, B, p. 122.

centimetre higher up, there were 2 degenerated fibres only, both small.

In another case (No. 4), the vith, the viith lumbar and the ist sacral roots were cut on the right side. Thirteen days were given for degeneration. The lumbo-sacral plexus was anterior. The right nervus erigens contained a fair number of degenerated fibres, although the great majority were normal. No degenerated fibres were found in either hypogastric.

So far, then, we may conclude:

(*a*) that the sacral nerves may send to the hypogastric of the same side 2 or 3 fibres which ascend in the nerve for at least two-thirds of its course.

(*b*) that besides these the sacral nerves send to the lower part of the hypogastric some fibres—it may be about two dozen—which curl backwards and run to the bladder and other viscera.

(*c*) that the nervus erigens receives few if any fibres from the sacral sympathetic.

Further evidence on all these points will be given later.

Ascending fibres from the lower part of sympathetic. In order to investigate whether there are such fibres, the lumbar sympathetic is cut below the point where the lowermost spinal branch passes off to the inferior mesenteric ganglion. This may vary from the vth to a little below the vith lumbar ganglion.

In No. 5 the sympathetic trunk was cut on both sides between the vith and viith lumbar ganglia, and six days left for degeneration. No degenerated fibres were found in either hypogastric.

In No. 11 the vith and viith lumbar ganglia were extirpated on the left side; no degenerated fibres were found either in the left nervus erigens or in the left hypogastric.

In these cases then, the lumbar sympathetic contained no medullated fibres destined for the pelvic plexus or hypogastric nerves. And probably no such fibres exist in other animals.

The nearer the point of section of the sympathetic is to the vth lumbar ganglion, the greater is the chance of cutting one or more of the spinal branches to the inferior mesenteric ganglion, as they pass through the sympathetic. Thus in Exp. No. 12, the left sympathetic trunk was cut between the vth and vith lumbar ganglia, and in exposing the vth ganglion a spinal branch in the mesentery was unintentionally severed. Here the majority of the fibres of the left hypogastric were degenerated, and about 30 of the right (cp. Appendix).

Effects of section of one hypogastric nerve.   (*a*) *Central End.*
We have four cases of section of the hypogastric, unaccompanied by any
other lesion.   At the cut end there was sometimes slight traumatic
degeneration, on this account we took for examination a piece of nerve
distant half a centimetre at least from the cut end.   In three cases we
found no degeneration in the central end of the hypogastric.   In one
there were four small degenerated fibres.   In another case (No. 10) in
which the nerve was tied instead of being cut, the whole of the central
end of the nerve (about a quarter of an inch) had undergone traumatic
degeneration, there were no sound fibres and scarcely any remains of
medulla.

Section of the hypogastric would cause in the central end of the
nerve, degeneration of fibres ascending in it from either the sacral
nerves or from the lower part of the sympathetic.   These then may
vary from 0 to 4.   As we have seen no reason to believe that there are
any such sympathetic fibres, we take the ascending fibres when they
occur to arise from the nervus erigens.

(*b*) *Peripheral End.* Section of the hypogastric causes almost
complete degeneration of the fibres in its peripheral end.   In the
following table we give the number of sound fibres found a short
distance below the place of section.

Exp.	7	11	12	8	6	9	16	19	18	13	15	14
No. of sound fibres	0	0	0	0	1	5	5	5	7	8	9	12

In accordance with the results previously given, we consider the
sound fibres here to be fibres arising from the sacral nerves.   The
difference in the number found in the several cases is due partly to
slight variation in the number of such fibres entering the hypogastric,
and partly to a variation of the region of the hypogastric taken for
examination.   Just as after section of the sacral nerves the number of
degenerated fibres diminishes in ascending the hypogastric, so after
section of the hypogastric the number of sound fibres increases in
descending the hypogastric.

The sound fibres were in all cases less than 4μ, and as a rule they
were 2·5 to 3μ.

(*c*) *Opposite Hypogastric.* No degenerated fibres were found in the
hypogastric on the side opposite to that cut in Nos. 6, 7 and 9.   But in
No. 10, although the right hypogastric was cut more than an inch from

the ganglion, the left hypogastric contained 2 degenerated fibres. It is possible that these were sacral fibres, ascending by the right hypogastric and descending by the left, but we think it more likely that their presence was independent of the section, and that they represent the fibres with fragmented medulla, which, according to S. Mayer, are sometimes to be found in peripheral nerves. In the case (No. 8) in which ligature of the nerve had caused traumatic degeneration up to the ganglion, there were 1 to 2 dozen small degenerated fibres in the opposite hypogastric, this was no doubt due to the traumatic degeneration affecting some of the nerve fibres which decussate (cp. p. 186) in the inferior mesenteric ganglion.

(d) *Non-medullated fibres.* The absence of medulla makes an important difference in the appearances which accompany degeneration in nerve fibres. The non-medullated fibres show no striking evidences of degeneration. The fibres in the peripheral end of the cut nerve seem simply to dwindle, occasionally they became finely granular, but commonly we have not found this. In teased specimens they break up into very delicate elongated spindle shaped filaments; in transverse sections, even after ten days of degeneration, they differ very little from normal fibres.

(e) *Stimulation of the cut peripheral end.* The effect of section of the hypogastric upon the functional activity of its peripheral end, might have been given appropriately in the earlier Paper, but, since this effect requires the histological observations to explain it, we thought it best to give the two together. Stimulation of the peripheral end of a hypogastric nerve which has been cut for five or more days has in most cases no effect. Once we observed a slight contraction of the bladder, in this case a small ganglion was found a little below the point where the nerve was cut; the survival of function was no doubt due to the fibres proceeding from the nerve-cells of the ganglion. In stimulating the peripheral end of the hypogastric, care must be taken that the electrodes are not placed too near the region where its branches are joined by fibres from the nervus erigens. This is unavoidable, if the hypogastric be cut originally at some distance from the inferior mesenteric ganglion; in such a case, stimulation of the peripheral end of the hypogastric will cause more or less pronounced contraction of the bladder.

Section of the spinal branches of the inferior mesenteric ganglion. This lesion causes degeneration of all save a few fibres in both of the hypogastric nerves. Still those that remain are distinctly

more in number than those which degenerate in the central end of the hypogastric after it has been cut. The excess may represent fibres which escaped section—for example by running in the sheath of the inferior mesenteric artery—or it may be due to fibres which become medullated after leaving the nerve-cells of the inferior mesenteric ganglion. In the following Table we give the number of sound fibres in the hypogastrics near the ganglion, after severance of the connections of the ganglion with the spinal cord. In all these cases one hypogastric nerve was also cut, in the first three, the right; in the last, the left.

Exp.	13	14	16	15
Right hypogastric	17	11	13	8
Left hypogastric	9	7	13	20

The evidence for the existence of medullated fibres from the ganglion cells is not very satisfactory, for the number of sound fibres in the uncut hypogastric is not appreciably greater than the number in the peripheral end of the cut hypogastric (cp. p. 182). But some further evidence in favour of this possibility is afforded by the existence of a few sound fibres in the peripheral end of the cut spinal branches (cp. next section).

The short ciliary nerves which proceed from the cells of the ciliary ganglion are known to be medullated. We have to thank Dr Sherrington for the ciliary ganglion and short ciliary nerves of a cat in which the IIIrd nerve had been cut some time previously. The branches of the IIIrd nerve to the ganglion were of course degenerated, but the short ciliary nerves showed no sign of degeneration.

Spinal branches of the inferior mesenteric ganglion. These consist chiefly of medullated fibres with a variable number of non-medullated. The number of medullated fibres we have not counted, they are much more numerous than in the hypogastrics; the majority of the small ones are connected of course with the cells of the ganglion; near the sympathetic, the spinal branches contain a certain number of large fibres, the large fibres for the most part run off to the mesentery dorsally of the ganglion, there they divide (decreasing somewhat in calibre) and end in Pacinian bodies. A few run on in the colonic and other branches of the ganglion, and of these some can be traced to Pacinian bodies in the more ventral parts of the mesentery. Section of one

hypogastric does not cause, so far as we have seen, any degeneration in the spinal branches of either side.

After section of the spinal branches themselves, there were in the cases we examined a few sound fibres in the peripheral ends of the cut nerves, (No. 17 and No. 19). In the central end we found in one case no degenerated fibres and in another (No. 14) 12 small degenerated fibres.

Colonic Nerves. These are like the hypogastrics except that they contain fewer medullated fibres.

Relative number of efferent and afferent fibres. In three experiments the roots of the first five lumbar nerves, with or without others, were cut. Thus there was degeneration of nearly all or of all of the efferent fibres, whilst the afferent fibres, being still connected with the posterior root ganglia, remained intact. In two of these (*op. cit.* Ser. G. No. 1 and No. 3) the central end of the right hypogastric gave no reflex on the bladder or internal anal sphincter. The number of medullated fibres found in the hypogastrics was as follows :—

Ser. G. No. 1.   ɪ to v lumbar roots cut on both sides.   10 days.

	Right hypogastric	Left hypogastric
7 to 8μ	0	3
5μ about	1	2
4μ or less	37	53
	38	58

Ser. G. No. 3.   xɪɪ thoracic to v lumbar roots cut.   6 days.

7 to 9μ	0	2
6μ	0	1
5μ	1	1
3 to 4μ	4 ⎫	58
3μ or less	77 ⎭	
	82	62

In the one case, then, the total number of medullated fibres remaining in the two hypogastrics was 96 and in the other case 144. And not all of these were necessarily afferent fibres; for it is possible that a few were medullated fibres proceeding from the ganglion cells, and a few may have been efferent fibres from uncut nerves, insufficient to produce a sympathetic reflex. These numbers are unexpectedly small. We have seen that in the normal hypogastrics taken together, the medullated fibres vary from about 950 to about 1650. If we assume that these numbers represent the numbers originally present in cases No. 1 and No. 3 respectively, then in No. 1 $\frac{1}{10}$ only of the medullated fibres were

afferent fibres, and in No. 2 less than $\frac{1}{11}$. The assumption can hardly be so wide of the mark, that we may not take $\frac{1}{10}$ of the medullated fibres as representing roughly the proportion of afferent fibres to the whole.

In the spinal branches to the inferior mesenteric ganglion the proportion of afferent fibres is still smaller, for though these contain some afferent fibres which run to the mesentery, these are few, whilst there are a large number of small medullated efferent fibres which lose their medulla in the inferior mesenteric ganglion.

In the third case, the central end of the hypogastric gave (on electrical stimulation) a distinct though much diminished reflex on the bladder and internal anal sphincter. Here we had expected to find a considerably larger number of undegenerated fibres. There was, however, a slight difference only between the number here and in No. 3.

		Right hypogastric	Left hypogastric
Ser. G. No. 2.	About 8μ	0	1
	„ 5μ	1	1
	„ 4μ	13	13
	3μ or less	57	72
		71	87

Fibres decussating in the inferior mesenteric ganglion. We have shown experimentally (*op. cit.* p. 423) that the nerves and spinal branches of one side whilst running in the main to the hypogastric of the same side, run in part to the hypogastric of the opposite side. Such of these fibres as end in the cells of the inferior mesenteric ganglion cannot be satisfactorily counted, because of the tortuous course they take amongst the cells. But we have attempted to form some idea of the number of fibres which proceed from one side and continue as medullated fibres down the opposite hypogastric nerve. The number of such fibres appears to be in direct ratio with the degree of anatomical connection of the ganglia on the two sides. This, as we have pointed out earlier, varies very considerably.

In No. 19, the ganglia of the two sides were intimately connected together. On the left side there were three spinal branches, one unusually large and two small. The large branch, containing the majority of the spinal fibres running to the ganglion was cut. This caused degeneration of 79 fibres in the opposite hypogastric, two of these being of medium size.

In No. 18, the connections between the ganglia of the two sides were very scanty. Section of the left spinal branches, except an anterior one, caused degeneration of 21 fibres only in the left hypogastric; these were all small.

We are indebted to Dr Sherrington for the hypogastric nerves of two cats in which he had cut the first five lumbar nerves on the right side. The degeneration time was 17 days in one (No. 23) and 27 days in the other. Even in the first case mere traces only of degeneration remained. We give the number of normal fibres found.

		Right hypogastric	Left hypogastric
No. 23.	About 8μ	1	0
	„ 5μ	3	0
	„ 4μ	35	43
	3μ or less	93	142
		132	185
No. 24.	About 5μ	2	0
	4μ or less	233	379
		235	379

The result in each case implies a very considerable decussation of medullated fibres, but the unknown factors are too many to allow any definite numerical statement to be made.

Splanchnic Nerves. The splanchnic nerves, major and minor, resemble the spinal branch to the inferior mesenteric ganglion. The number of medullated fibres they contain is of course much greater; the large fibres form a striking feature under the microscope, but we doubt if their relative number is very different from that of the spinal branches to the inferior mesenteric ganglion. The nerve strands given off from the ganglia of the solar plexus appear to us to have relatively more medullated fibres than the colonic branches of the inferior mesenteric ganglia and relatively fewer than the hypogastrics.

From the homology which exists between the splanchnic and the spinal branches of the inferior mesenteric ganglion we may fairly conclude, that in the former as in the latter, the efferent fibres are very much more numerous than the afferent fibres.

<div align="center">CONCLUSIONS.</div>

The hypogastric nerves in the cat consist chiefly of non-medullated nerve-fibres, although they contain also a considerable number of medullated fibres.

The size of the nerves and the number of medullated fibres they contain is unequal on the two sides; the right hypogastric, so far as our experience goes, is usually the larger.

The number of medullated fibres in each hypogastric varies from about 350 to about 900. In the two hypogastrics together, the number varies from about 950 to about 1650.

The fibres are chiefly very small, 1·3 to 2μ; there are many from 2μ to about 3μ, and a not inconsiderable number, e.g. 70, from 3μ to about 4μ. There are very few larger than 4·2μ, and the number varies; broadly speaking we may say that there are 1 to 6 of about 5μ (4·2 to 6·5) and 0 to 2 of about 8μ (6·5 to 9μ).

Since the central end of the hypogastric appears to possess constantly afferent fibres of pain, we conclude that such fibres are in some cases of not greater diameter than 6·5μ.

The large medullated fibres (7 to 12μ) in the spinal branches to inferior mesenteric ganglion and to the coeliac plexus run chiefly at any rate to the Pacinian bodies.

The sacral nerves send a variable number of fibres, up to 1 or 2 dozen, into the lower end of the hypogastric, but nearly all these turn back with the hypogastric fibres to the bladder and other viscera. A few small fibres, 1 to 5, sometimes continue on in the hypogastric. Their destinations we have not traced.

No medullated fibres, so far as we have seen, descend the sympathetic to pass to the nervus erigens or hypogastric by way of the sacral rami.

After section of the spinal branches to the inferior mesenteric ganglia, we have not found less than 7 nor more than 20 medullated fibres in one hypogastric. Some of these may be fibres which have escaped section, e.g. by running in the sheath of the inferior mesenteric artery; or they may be fibres proceeding from the cells of the inferior mesenteric ganglion, but which nevertheless are medullated, just as are the fibres given off by the cells of the ciliary ganglion.

The number of afferent fibres in the hypogastrics is small compared with that of the efferent fibres; roughly speaking we may take the former to be about $\frac{1}{10}$ of the latter. The proportion of afferent to efferent fibres is smaller than this in the spinal branches to the inferior mesenteric ganglion, and presumably in the splanchnics also.

Medullated fibres pass from the spinal branches on one side to the hypogastric of the opposite. The number of these varies considerably, and apparently in correspondence with the degree of anatomical connection of the ganglia on the two sides.

DETAILS OF SOME OF THE OBSERVATIONS.

One hypogastric nerve cut.

	Central end of cut hypogastric.	Peripheral end of cut hypogastric.	Remarks.
No. 6. Left hypogastric cut 1 inch or rather more from the ganglion. 10 days. (Ser. E. No. 1.)[1]	No degeneration.	All degenerated except 1 small fibre. Near the hypogastric was a small strand also cut, containing no sound fibres near the cut, but 12 sound near the plexus.	A blood-vessel in the mesentery dorsally of the hypogastric had 3 small sound and no degenerated fibres running with it. The right hypogastric had no degenerated fibres; it contained about 470 medullated fibres, of which 1 was large.
No. 7. Right hypogastric cut ¾ inch from ganglion. 10 days. (Ser. E. No. 2.)	No degenerated fibres except a few close to cut end.	No sound fibres.	No degenerated fibres were found in the left hypogastric.
No. 8. Right hypogastric tied ¼ inch from ganglion. 6 days.	Traumatic degeneration up to ganglion. No medulla.	No sound fibres. But a small blood-vessel joining (or leaving) the nerve a little below the ligature, had with it a small normal nerve filament. Some ganglion cells a little below the ligature.	No degeneration seen in the spinal branches to the ganglion. Left hypogastric had no large fibres, there were one to two dozen degenerated near the ureter.

[1] This refers to the numbering of the Experiments given in the earlier paper. This *Journal*, xvi. 410, 1894.

| No. 9. | Right hypogastric cut about 1 inch from ganglion. 5 days. (Ser. E. No. 4.) | No degeneration. Nerve had two or three medium fibres but no large. | 5 small sound fibres, rest degenerated. | |
| No. 10. | Right hypogastric cut about 1¼ inch from ganglion. (Ser. E. No. 5.) | 4 small degenerated fibres. Sound fibres 654. (cp. p. 179.) | Near division 16 small sound. Just above division 25 small sound. In branches 45 small sound. | In left hypogastric, 2 small degenerated fibres. Sound fibres 404. |

On Hypogastric Nerve and Sympathetic Chain cut.

| No. 11. | Left hypogastric cut close to ganglion. Left vith and vith lumbar symp. ganglia removed. 6 days. | Some fibres degenerated, probably traumatic. | Near cut end, all degenerated. At division, 3 small sound. | Right hypogastric, no degenerated. Sound fibres 918. |
| No. 12. | Right hypogastric cut near ganglion. Left synp. cut below vth lumbar ganglion. 8 days. | About 30 degenerated fibres. | No sound fibres within ¼ inch of cut end; close to first branch to bladder, 4 small sound. | Left hypogastric, 133 sound of which 2 are large, more than 250 degenerated. |

Spinal Branches and one Hypogastric cut.

		Uncut Hypogastric.	Central end cut hypogastric.	Peripheral end cut hypogastric.	Remarks.
No. 13.	Spinal branches cut. Right hypogastric cut 1 to 1¼ inch from ganglion. 5 days.	All degenerated except 9 very small.	All degenerated except 1 of 3μ to 4μ and 16 very small.	Near division; all degenerated except 3 of 3 to 4μ and 5 very small.	
No. 14.	Like preceding. (Ser. F. No. 1.)	7 small sound.	Degenerated except 1 of 3 to 4μ and 10 of 3μ or less.	Degenerated except 1 of 3 to 4μ and 11 of 3μ or less.	Chief right spinal branch has apparently 12 small degenerated in central end.
No. 15.	Like preceding but left hypogastric cut. 6 days. (Ser. F. No. 3.)	8 small sound ½ inch from ganglion; 13 near division.	20 small sound, most 1·5 to 2μ.	8 small sound, of which 1 was 3 to 4μ.	On right side there was a small filament dorsally of hypogastric, containing 10 small sound and some degenerated.
No. 16.	Like No. 14. (Ser. F. No. 3.)	11 small and 2 large sound.	13 small sound.	5 small sound.	

Unilateral Section of Spinal Branches and one Hypogastric.

		Uncut Hypogastric.	Central end cut hypogastric.	Peripheral end cut hypogastric.	Remarks.
No. 18.	Left spinal branches except one, and left hypogastric cut. 8 days.	21 small degenerated.	Many degenerated.	7 small sound. Some ganglion cells in cut end.	Degeneration in some fibres far advanced.
No. 19.	Main spinal branch on left side, and left hypogastric cut. 7 days. (Ser. E. No. 3.)	2 medium and 77 small degenerated.	Majority degenerated.	5 small sound.	Cut spinal branch, central end, ? 5 small degenerated; peripherally 9 small sound.