A treatise on the use of the sympathetic nerve and its ganglions : with their influence on various diseases of the abdominal and pelvic viscera.

ON THE USE OF

THE SYMPATHETIC NERVE

AND

ITS GANGLIONS.

A TREATISE

ON THE USE OF

THE SYMPATHETIC NERVE

AND

ITS GANGLIONS,

WITH

THEIR INFLUENCE ON VARIOUS DISEASES

OF THE

ABDOMINAL AND PELVIC VISCERA,

BY

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TO THE MEMORY OF

THE BARON DUPUYTREN,

MEMBER OF THE INSTITUTE OF FRANCE, OF THE LEGION OF HONOUR,
CHIEF SURGEON TO THE HOTEL DIEU,
PROFESSOR OF THE FACULTY OF MEDICINE OF PARIS, ETC. ETC.

ALIKE DISTINGUISHED FOR

HIS EXTRAORDINARY TALENTS,

HIS DEVOTION TO, AND SUCCESS IN, THE SCIENCE OF SURGERY,

THIS TREATISE

IS MOST RESPECTFULLY DEDICATED,

IN GRATEFUL REMEMBRANCE OF

INFORMATION AND ADVANTAGES DERIVED DURING AN ATTENDANCE
UPON THE HOSPITAL PRACTICE AND CLINICAL LECTURES
AT THE HOTEL DIEU IN PARIS,

BY THE AUTHOR.

CONTENTS.

INTRODUCTION.

THERE is no part of the human economy which has been studied with so much assiduity as the nervous system. It has been examined by men who have united extraordinary patience and skill in dissection, with cautious and well-devised experiment. Nor have observations drawn from pathology and comparative anatomy been wanting. The long list of splendid names which intervene between those of Willis and of Bell proclaims that no want of enthusiasm in the prosecution of this arduous investigation can be charged against the professional men of any civilized nation.

How, therefore, can it be accounted for that until lately so little was accomplished, and that even at present we are less acquainted with the functions of the brain and nerves than with those of the muscular, vascular, and respiratory systems? Evidently from the much greater difficulty that attends the investigation.

The extreme intricacy, minuteness, and apparent confusion of its structure and arrangement; the difficulty of devising

experiments of a conclusive character, and the still greater difficulty of performing them without destroying other parts essential to its action, are circumstances which readily explain our present comparative ignorance.

One man discovered the circulation of the blood;* another the functions of the absorbents; but no one man could have discovered the use of the nerves. The late Sir Charles Bell, who has given the clearest and simplest exposition of a great portion of the subject, had the way paved for him by the innumerable dissections, conjectures, surmises, and hypotheses of his predecessors; and even by their failures, since every idea that may be broached, if shown to be fallacious, still narrows the question for future enquirers.

It is much to be regretted that in the prosecution of this profound subject by numerous gifted philosophers, so much acerbity has been shown, so many disputes have arisen as to originality, and such aversion displayed to acknowledge or blindness to perceive what was due to predecessors or contemporaries. This, however, seems to be the failing of discoverers in all difficult sciences. They are naturally jealous of hard-earned honours. But nothing scarcely can be entirely original in all its elements. The temples of science are built of old materials incorporated with new.

Taking this view of the matter, I have been bold enough, notwithstanding the great array of learning and talent to which I

* I allude, of course, to Harvey. Servetus had certainly hit upon the theory, but there is no probability that the English physician had read a work of which all the copies but two were burnt with their unfortunate author.

have alluded, to put forth the following observations upon the *sympathetic nerve*,—confessedly an important part of the nervous system, but the one of which I think less is known than of any other. I trust I may not appear presumptuous in entering on the subject. It struck me some time since, that notwithstanding the very important discoveries and arrangement of the nervous system by our late distinguished countryman, Sir Charles Bell, it was quite clear he was still at a loss to ascribe to this particular nerve its proper use, and that that which he advances upon it is mere suggestion or hypothesis, and not borne out, as his statements relative to the other nerves are, by experiments and analogy; not satisfying himself, or physiologists in general.

Nor have the more recent but scarcely less valuable discoveries of our also distinguished countryman, Dr. Marshall Hall, by any means exhausted the subject, although he has given a key to many of the phenomena in animal life, which before had appeared so obscure and difficult as to deter individuals from attempting to comprehend or explain them, and, what is of more importance, endeavouring to form a rational mode of obviating the maladies to which man is subjected.

Perhaps with our present knowledge little more can be done; still as an open field is left to work upon, and we know that even slight hints, and those from obscure individuals, have had the effect of producing most important results, by calling the attention of some master mind to the subject, I am induced to publish this brief exposition.* If the ideas it contains possess any originality, it will be a

* See Note A at the end of the Treatise.

source of great satisfaction to me. If I have overlooked or not clearly comprehended the opinions of others, I shall bow to fair criticisms with the respect due to truth. I trust my observations will be received in a similar spirit.

Having premised so much, I shall now proceed more immediately to the subject in question.

A TREATISE,

ETC. ETC.

I.—DEFINITION OF THE TERM.

In the *name* which the sympathetic nerve bears, we have perhaps one of the best proofs of the total ignorance which has existed, and, I am bound to add, does now exist, as to its functions and nature. At this we cannot feel surprised when we call to mind the views which have until a very late period prevailed even amongst the best anatomists and physiologists.

Ignorant as our predecessors were of the functions of nearly all the nerves of the body, we cannot be surprised that they should have thought that it was a nerve of the brain, proceeding principally from the sixth, and the second division of the fifth, nerves, thence passing through the carotid foramen, descending with the nervus vagus down the neck to its divisions to the heart, and then, as the *intercostal*, to the viscera. They were aware that the nerves were the only organs capable of conveying the sympathies from one part of the human frame to another, and

seeing the connection between the several parts—how the emotions expressed in the countenance, as blushing, &c., proceeded from the action of the mind on the body, they observed also the affections of the organs of sense evidenced in sneezing from tickling the nose, and accounting for all by sympathy through this nerve, thereby occasioned the use of a term so misapplied; for the nerve will presently be shewn to be quite void of all feeling and sensibility, it being clearly proved and demonstrated, in some experiments made on the subject, that neither the nerves nor any part of their ganglia are possessed of the least feeling. Hence it is seen how an error in nomenclature, like errors in general, tends to keep up and propagate itself.

However the term "ganglionic system," as applied to this nerve by Bichat, may have been condemned by Sir Charles Bell and other authors, and inapplicable as it really is from the fact that other nerves have their ganglions, still it must be allowed (even with this objection) to be infinitely preferable to the one it has so long borne. It is, however, to be hoped that as our knowledge of the structure and functions of this system of nerves advances, a name will be applied to it, which will better indicate its proper use and character.

II.—ANATOMY OF THE NERVE.

The *anatomical* relations of the sympathetic nerve in the human body have been accurately traced and elegantly described by *Lobstein*, and finely illustrated by the graphic labours of Walter, Scarpa, and Swan. The intimate structure of its ganglia has been developed long since by Munro, and so well, that recent enquirers have found little to supply.

The later labours of anatomists have been devoted to extending our information as to the remote origins or terminations of this nerve in the head, and as to its particular connection with the cerebral nerves. Without entering minutely into those points, it may be sufficient to observe generally of the anatomy of this nerve, that some difference of opinion exists as to where we should fix its commencement, some inclining to the opinion that the minute filaments by which it is attached to the fifth, sixth, and other cerebral nerves constitute its origin; others again conceiving, by reason of its remarkable difference from the cerebro-spinal nervous system in respect to symmetry, &c. that they are distinct, and that the centre, or point of commencement of the former, should be referred to the situation where its developement is most ample, namely, the abdominal region.

To this latter opinion I am strongly inclined, that the sympathetic nerve is a system totally distinct from the cerebro-spinal system: which idea is, I think, in some degree borne out by the fact that a portion of the parts supplied by the sympathetic

nerve is in embryo existence before the brain or spinal marrow is formed, (the heart for instance.) It is true this nerve is intimately connected with the cerebro-spinal system, and I think it will be ultimately shown, that the connection exists for a purpose, the object of which I shall endeavour to develope in the course of this paper, and to which I cannot but attach some importance; hence the fallacy and uselessness of discussing or searching for the origin or termination of this nerve, unless, as regards the latter, to enable us to develope and explain its functions and use. A glance, however, at this dispute is enough to show that it can scarcely be tested by anatomy alone; that it has arisen rather from the physiological views of anatomists than from any other cause; and that even to physiology the order of description is indifferent, since, wherever it may be said to *begin* or *end*, the terms are readily transposed or altogether changed if we should discover the nature of its functions, and the order in which they are exerted.

My object is to show the very intimate connection which exists between this important system of nerves and the arterial system. It will be observed that the relations of these nerves to the arteries are totally distinct and different from those of any of the other nerves of the body.

All other nerves, for instance, (when they do travel in the same direction with any of the arteries,) appear to be content to pursue the same road together, without giving a solitary branch or fibre to their fellow-travellers, pointing out clearly that they have nothing in common, except perhaps destination, and that they are for totally distinct uses and perfectly unconnected with each other. Not so

the sympathetic; this, on the contrary, clings to the artery so closely that in many places the latter appears to be absolutely surrounded by the nervous meshes and ganglia, the nerve watching, as it would seem, for every branch (small or large) that is given off by the artery, in order to furnish one also, to fasten upon and cling to the arterial branch unto its destination, entering into its coats in every direction, and pointing out, as plainly as it is possible to do, that their functions are closely connected, and, indeed, inseparable.

This difference is too marked to escape the inquiring eye, and the conclusion I wish to bring my readers to will necessarily follow, that a connection of no ordinary character does exist.*

Let us, then, proceed to see if what I have to propound will tend in any degree to unravel this great mystery.

Although I am well assured an anatomical description of any part of the nervous system might be considered by my readers superfluous, I have repeated its description that we may have the practical parts immediately in view before we commence reasoning on this difficult subject.

Without, therefore, entering into the anatomy of the sympathetic nerve further than may be convenient to collect such leading features as serve to connect what I have to propose concerning functions with the actual structure, the following sketch is presented.

In the abdominal region the nerve is larger in the aggregate and more abundant in ganglia, and more divided and

* See Plate I. at the end of the Treatise.

subdivided into meshes and plexuses, than elsewhere; on either side of the cœliac axis and in contact with the aorta are found those large irregular ganglions which unite together in meshes of that shape which are denominated *semilunar*. Short branches from these derived from and forming other and smaller ganglia and interlacements with the fibres of each other constitute around the cœliac artery and its divisions the solar plexus.

The solar plexus divides into plexuses, which, under names corresponding with those vessels, accompany and supply the *hepatic*, *splenic*, *emulgent*, *mesenteric*, and other arteries of the abdominal viscera. Accompanying the arteria *hypogastrica vesicalis uterinæ*, &c. in a similar manner, the ramifications of the same great divisions of the sympathetic pass downwards into the pelvis, where, as well as in the loins, it is connected with the continued trunk of the sympathetic, which we shall presently advert to.

Upwards the abdominal plexuses are connected with the central trunk by the two splanchnic nerves, which, penetrating the diaphragm from the chest, distribute themselves, one immediately into the solar plexus, the other into the emulgent. The continued trunk of the sympathetic, extending from the thorax to the sacrum, is lodged on the lateral surfaces of the bodies of the vertebræ, and forms ganglia in the interstices on the sides of the bodies of all the dorsal, lumbar, and sacral vertebræ. These ganglia, nearly constant in their existence, are connected with one another by the continuous thread; this thread is, however, sometimes double.

The *lumbar ganglia* unite their filaments with the spinal

nerves, emerging from the intervertebral foramina; they supply also the aorta and the lumbar arteries, and, as before stated, anastomose with the plexus of the arteries supplying the alimentary system.

The *sacral ganglia* are connected with each other by the same continuous thread. The branches derived from them are inseparably united with the sacral spinal plexus, and especially with the branches thence derived, which are destined to supply the organs of generation. (*Vide Walter's Icones.*)

In the chest we find the chain of thoracic ganglia tied together by the continued trunk and giving branches to the intercostal spinal nerves, to the aorta and œsophageal arteries, to the lungs by plexuses, which, however, are chiefly derived from the eighth pair and the cervical ganglions, and to the abundant filaments of the heart. Moreover, two large and distinct trunks, called the greater and lesser splanchnic, are derived from the five lowest ganglia, and penetrate the diaphragm as before mentioned, to form or unite with the great abdominal plexus.

The cervical ganglia, three in number, of which the middle is sometimes wanting, especially on the right side, are more remotely separated than the rest, but the connecting trunk is still met with. This trunk and the ganglia send off branches which anastomose with all the nerves of the neck, whether cerebral or spinal, without exception. Several plexuses are formed by these unions, the most remarkable of which are the pharyngeal. The next series of filaments are those which accompany the arteries; those around the carotid, denominated nervi molles,

being the most remarkable; other branches, especially the superficialis cordis, descend along the same vessel in a more continuous manner to the heart. From the inferior cervical ganglia the sympathetic trunk, passing upwards with the internal carotid into the carotid canal in the form of two slender filaments, separates around the vessel into a remarkable plexus. The component threads of this plexus reunite to form, 1st, a distinct filament, which joins the inferior branch of the vidian nerve; 2nd, two or three small nerves, which, soft and transparent, make a ganglion from plexuses in the cavernous sinus, from which are sent the attachments of the sympathetic to the third pair; also some branches traceable to the ophthalmic ganglia, some to the pituitary gland, and others to the fifth and eighth.

In the ear this nerve also sends off filaments. Besides its connection with the fifth through the vidian, the sympathetic has a direct junction with the nasal branches of the first division of the fifth. A considerable plexus adheres to the ophthalmic artery and follows its minutest ramifications. One accompanying the centralis retinæ has been supposed to establish the relations between the retina and the rest of the nerves. A few accompany the cerebral division of the internal carotid, but are not numerous.

III.—PHYSIOLOGY AND PATHOLOGY.

The use of the sympathetic might almost be derived from the consideration of its anatomy alone. When we observe its ramifications accompanying every artery with which they come in contact, and this in great abundance, and that it is traceable into their coats, the suggestion obviously occurs,—Must there not be some connection between the action of the arteries and this nerve? Such an idea appears to have presented itself in an obscure manner to many. Some physiologists attribute to the sympathetic the function of secretion, others that of digestion; and others again make it the cause of the peristaltic action of the bowels. This opinion is stated to be founded on direct experiment, but I have not been able to verify it.

Bichat finds the semilunar ganglion insensible.

Watser repeats his experiments with the same results.

Lobstein the same.

Haller, however, says, " visum est animal doluisse."—*Op. Minor.*, p. 237. But Flourens contradicts all this: 1st, having exposed the semilunar ganglion in a rabbit and pinched it, " l'animal répondit par des secousses brusques et générales."

2d. He pinched the different divisions which exist in this creature's ganglions, and found that " l'animal s'agita, se debattit,

cria, témoigna de toutes les manières, qu'il était sensible à ce genre d'irritation."

He repeats the experiments, and justly and candidly says that he did nothing but pinch them, for "le moindre tiraillement, pouvant se communiquer aux nerfs spinaux, qui, de près ou de loin, se joignent aux ganglions, compliquerait et embrouillerait tout." So he concludes it is a nerve of sensation, or at all events excito-motory. He finds, however, only feeble marks of sensibility in the middle or lower cervical ganglions, none in the upper. Hence he says it follows that the semilunar ganglion is constantly excitable; that the other ganglions are only so "de loin en loin," and that in a feeble degree. The nearest approach to a positive determination of its use that we can come to with our present limited knowledge is, that it is for the purpose of regulating the tonic contraction of the arterial system, and for *nothing else;* however, it is difficult to expound or afford the requisite proofs of this opinion, nor am I aware that public attention has at all been called to it. I venture therefore, allowing this idea to form the basis of my investigation, to proceed to explain my present views upon the subject, first calling the reader's attention to the remarkable fact with which the discoveries of Sir C. Bell have made us acquainted —that there is not a part of the human body that is not supplied with two or three sets of nerves according to the simplicity or the intricacy of its functions; the excitors for sensibility, the motors for movement, and the respiratory system for the complicated purposes of respiration. When we see by the discoveries of Dr. M. Hall that we have a presiding and regulating power over

all the sphincters and muscles of the body through the medulla oblongata and the medulla spinalis, and in fact that there is scarcely an organ in the human body that is not now *known to have* a moving and directing power; is it then probable or even possible that so important a system as the arterial should be without such a controlling and directing power? Acknowledging that it is not, as every one must necessarily do, and coupling this with the fact that there is a large and evidently important system of nerves exclusively surrounding, embracing, and running into the coats of the arterial system, of which we know little or nothing;* and when we see the remarkable way in which anatomy bears out this opinion, I would venture to predict that so surely as anatomy led Sir C. Bell on step by step to his admirable, lucid, and conclusive arrangement of the other nervous systems, so surely does anatomy point out to us most distinctly the functions of *this* nervous system; and doubtless the time will arrive when it will be capable of demonstration: difficult as I confess it now appears to be, from its peculiar situation in the body, and from its apparent total want of functional connection with the other systems. It is singular that up to this period no author has sufficiently pointed out the remarkable difference in appearance and structure

* "The functions of this system are known only by negatives: we have ascertained that they have nothing to do with volition, nor with sensation, nor with respiration, nor with expression, nor with sound and speech. We are left therefore to the conjecture that the sympathetic or the ganglionic system of nerves, according to Bichat, are for those thousand secret operations of a living body which may be called constitutional. Circulation, secretion, and absorption are operations which simultaneously affect the entire frame."—*Sir C. Bell on the Nerves*, p. 11.

between the ganglion of the sympathetic and those of the spinal nerves. A single glance will be sufficient to shew this very marked difference; it is seen that in *Fig.* 1, *Plate* II., (the sympathetic ganglion) the nerves appear to be more like elongations of the ganglion, each coming out clear and distinct, like so many tails, the ganglion itself being of an oblong shape and smooth. In *Fig.* 2, (one of the spinal ganglia,) in which the nerves are seen entering the globe-like body of a ganglion in bundles, they leave it in the same divided or fascicular form.*

And now, in the first place, without entering into the much debated question as to whether the arteries propel the blood by alternate contractions and dilatations, there can be little dispute that there is a certain tonic contraction by which the calibre of the vessel is occasionally diminished and expanded. This is proved by dissection of aneurismal limbs, or where small arteries being cut retract and contract also. Now there appears reason to suppose, since we observe the arteries evidently increase in size when a part is thrown into violent action, that every structure when in exertion requires more arterial blood than when at rest. When the stomach is in action, it is more amply supplied than the bowels; if the latter be quiescent at the first period of digestion—and the same holds good with regard to the liver, kidneys, and other parts.

Secondly, the existence of these vicarious actions being established, it follows that they must have some regulating power. The presence of food in the stomach might be supposed by mechanical irritation to produce the requisite influence, and the passage

* See note B at the end of the Treatise.

of chyme into the intestines excite analogous effects. But the various periodic changes of appetite, the act of evacuation, and the consentaneous operations of the duodenum and the liver must require something more.* The nervous power is evidently competent to this effect, and no other nerve being found in connection with most of the arteries of the trunk, to the sympathetic this regulating power may be fairly attributed.

Thirdly, the objection which may be raised that the sympathetic ought not to regulate the distribution of the blood, since many arteries, viz. those of the limbs, have their nerves from other sources, is thus answered. It is clear that the ramifications of the sympathetic *do extend* in the *arterial coats* even to their *ultimate extremities.* "Painfully," says Sir Charles Bell, "and "with a stretch of memory, we were formerly endeavouring to "recollect the relations and connections of the sympathetic nerve, "but now we know that it is extended universally; that its rela- "tions to the nerves of the head are not more remarkable (when "looked upon free of hypothesis) than its branches to the nerves "of the extremities; that it extends to all the internal viscera. It "is universally distributed *to all parts of the body*, and in this is "its peculiarity."—*Sir C. Bell on the Nerves*, p. 12.

This being the opinion of one of the greatest anatomists and physiologists of not only this country and age, but of all ages and countries, I presume there will be found but few to doubt the statement. To those few I would venture to recommend a more minute and careful examination of this subject; and I am assured

* See Note C at the end of the Treatise.

from my own personal experience (limited as it has been) that the result will be to confirm in nearly *every respect* the statement made by this great man. And surely this will go far to confirm the idea of the dominion or great influence this nerve may be presumed to have over the arterial system in general. Allowing this, I do not think it will be difficult to determine its specific action, at least by inference.

Arteries for secretions of various kinds are those which *appear* to be more immediately under the control of this nerve; as these secretions, some vicarious, others consentaneous, but all those influenced by the will, are of tardy and gradual change, they form a distinct class. We should naturally, however, expect to find that the muscles constantly and suddenly, vicariously or consentaneously, changing their action under the influence of the mind, should have the calibre of their respective arteries regulated by the same nerves which under the will inspire them with movements.

Fourthly. Another objection to my views on this subject will be derived from the inference that, since in nature all phenomena operate by simple laws, and since digestion goes on with greater force in the lower animals than in man, though in the latter the sympathetic is larger and more completely developed than in the former who have more powerful assimilating organs, *ergo*, the sympathetic cannot be the digestion-regulating nerve. Two important considerations, however, interfere with the deductions to be made from this syllogism. 1st. We are not certain that much of the nervous power derived from the spinal cord may not be exerted on the digestive and circulating systems in the lower order of animals,

since in them the parts connected with consciousness appear so insignificant that it is probable the same *distinction* between the higher and lower powers of the nervous system does not exist in them. 2d. The researches of Newport (Phil. Trans.) have given us reason to believe that even in the lowest grades of the animal creation the sympathetic exists as a perfect system, although often intimately connected in mere mechanical relation with the cerebro-spinal cord. A more intimate connection is of course to be expected of the vital and animal nervous systems of those orders in which the functions of those systems are closely united than in man, who presents a union of the conscious and automatic nerves related only by extreme points.

Fifthly. We have to consider next the important objection that may be raised in the evidence of Scarpa, that the cardiac nerves derived almost entirely from the sympathetic send off branches into the muscular structure of the heart independently of those which follow the arteries. Now, although these nerves do separate from the larger or visible branches of the coronary arteries, and dip into the muscular structure, they rejoin them at their extremities; of this we have actual proof in the following observations on the anatomy of the cardiac nerves of the horse. The heart of this animal is very large in proportion to that of others, and its nerves are larger, in correspondence with its muscular fibres.*

The nerves which Scarpa has so well depicted crossing the coronary vessels without supplying them have the character of the sympathetic, that is, equality of size at the commencement and the end.

* See Plate III. at the end of the Treatise.

Now, although these nerves appear to leave the coronary arteries and run into the muscles, we find by microscopical observation that they return to the extreme branches of the said arteries, and, what is equally remarkable, have small ganglia near their terminations, as may be seen in Figs. 3 and 4, Plate II.

To me, I confess, it is only another instance of the beautiful, all-wise, and perfect laws of Nature that the nerve should *not* pass in the same canals through the muscular texture of the heart, with the arteries. The intent appears to me manifest. The fine and delicate fibres of the nerve would inevitably be injured and their functions impeded by the pressure of the muscular fibres; hence we find the nerves which bear the greatest resemblance to the pure branches of the sympathetic running between the heart and its adherent pericardium over the great coronary vessels, and then dipping down and enmeshing the terminal cardiac branches.

It would appear that Boerhaave had some idea of this kind, for the cardiac ganglion discovered by Wrisberg, but named by Scarpa, is thus mentioned by Legallois: "Ce plexus moyen est "celui dont la compression, supposée pendant le diastole des "artères aorte et pulmonaire, était regardé par Boërhaave comme "une des causes qui faissant cesser la systole des ventricules et "ramenaient leur diastole."

Sixthly. The preceding explanation of the functions of the sympathetic, if allowed to be correct as far as it goes, may still be considered incomplete, as it may be asked, How are the numerous connections this nerve has with the other nerves of the body to be accounted for? With little difficulty: the nerves are

supplied with bloodvessels, and the energy of their functions depends much on the circulation ; hence the sympathetic may be to them as to other parts, the nerve that regulates the calibre of their arteries. And independently of this power there is probably a secondary use of the communication in question.

This secondary use is one common, I believe, to all nervous communications, but it has not yet been fully commented upon. It is the facility afforded for an interchange of nervous power. However incomprehensible its nature may be, the existence of a certain force or power in the nerves is matter of actual fact. This power, whatever its nature, obeys in some respects the laws of quantity ; it is capable of accumulation and exhaustion.* Now, considering the vicarious action of the human body, what can be more probable than that when one organ, say a locomotive muscle, is in action, the nerve which supplies it may derive from another nerve which is inactive at the time, a supply of the unknown force in question, which idea at once gives us a key to the connection between all the nerves of the body, however different their functions ; and assuredly the suspension which violent emotion and deep thought or feeling effects in digestion and on the secretions over which the sympathetic may be presumed to preside, indicates a high degree of probability that on such occasions the

* It was imagined by Mr. Herschel that the brain and the spinal marrow was a sort of ever-acting electric organ, from which currents are transmitted along certain of the nerves at the suggestion of the will, and that parts of it are spontaneously discharged at " regular intervals when the tension of the electricity " developed reaches a certain point."—*Lardner's Cyclop. Discourse on the Study of Natural Philosophy,* p. 343.

cerebro-spinal system borrows from this nerve much of its nervous power, (hence the remarkable symptoms that take place upon those occasions;) while the indolence of mind and voluntary muscles which occurs while the process of digestion is going on clearly points out the same sort of derivative action reversed.

The diseases of the sympathetic nerve have been little investigated; Swan, for some years, bestowed much attention on the subject, but it would appear that morbid anatomy has not thrown much light on its pathology. There can be little doubt, if what we have before propounded as to its functions be correct, it is the seat of many and grave maladies; or if not their immediate seat, that it produces them in the organs to which it is distributed.

But whatever the severity of its affections may be, they appear to be of a functional nature, as they leave few or obscure traces after death.

The distinction between functional and organic changes is not, I am aware, allowed by some pathologists. They affirm that in every instance of disease some physical change must exist, however difficult of discovery; and it must be confessed that as regards the sympathetic many changes may occur to its slender filaments and blood-stained ganglia, the detection of which may be next to impossible. But upon the whole it appears to be neither inconceivable nor even surprising that a nerve should lose its functions or have its power increased, or suffer pain without change in the structure of its particles, since even in inanimate nature many phenomena (viz. several magnetic and electric movements) are unattended with any physical alteration in the substance

through which their effect is recognised. In this view of the case we readily perceive how the sympathetic may be the original source of many of those frequent diseases which are characterised by irregular action of the heart and arteries; that by rendering the movements of the blood tardy in particular organs, it may cause them to become atrophied or hypertrophied, as the case may be. The phenomena of old age are well explained by the supposition, that the nerve is worn out; hence, the vessels being engorged and inactive, dropsy occurs; hence the arterial system loses its elasticity, and ossifications ensue; hence, also, every thing that exhausts the powers of the sympathetic tends to produce prematurely the same maladies and infirmities which characterize old age. Inebriation, gluttony, venereal excess, all operate primarily on organs that are supplied by the sympathetic. If (which there is no reason to doubt) the sympathetic follows the same law as other nerves, namely, that the more it is stimulated beyond nature the more its powers decay, we shall expect then that the practices above noticed would destroy its power.

IV.—PRACTICAL DEDUCTIONS.

Is there any practical good to be derived from these suggestions should they prove true? We know not, but the truth is never useless; and even imperfect as our views may be of the future effect of any physiological discovery, we at once observe this practical advantage from the establishment of a sound view of the pathology of the sympathetic nerve. If debility of its fine threads be a sufficient cause to throw into dissonant action the heart and arteries in some cases, should we not be inclined to abandon the practice which rests on depletion, counter-irritation, and treatment of this kind, and substitute in their place remedies and a regimen which may fortify and sooth the nerve?

If dropsy be often caused by obstruction in the flow of blood through the portal system, and this debility of action in the portal veins depend upon an exhausted state of the sympathetic, shall we torment the patient, and perhaps increase the debility in question, by the use of hydragogues and diuretic medicine, which can only be intended to act on the *effect* of the original malady, leaving the *cause* unacted upon (at least beneficially so); or, finally, knowing the inevitable tendency of disorder of this nerve to engender serious organic maladies, shall we not watch for the first symptoms of its decline to restore its tone, or at all events retard the period of its loss of energy? But, it will be asked, where are the means of re-

storing to a nerve the power it has lost? It may be replied, that although the restoration of a function utterly lost by time or long stimulation may be impossible, yet there is abundant evidence to shew that other nerves have their functions restored in a direct mode by medicine. Take, for example, the agency of strychnine on paralysis of the spinal nerves, of carbonate of iron on neuralgia, and what evidence have we that all the beneficial effects of stimulants and tonics are not through the influence of this nerve?

Nor can any one be ignorant that a regimen in which regularity and rest from mental emotions or exertions are insisted on, has produced still more remarkable restorations. I do not doubt that many with myself will think that by similar means the impeded functions of the sympathetic have been restored.*

A very curious fact confirmatory of the views which I have taken upon this subject, is, I think, afforded by the remarkable analogy which will be seen to exist between the action of strychnia and of electric or galvanic influence upon functional disorders in some of the organs over which the sympathetic, *and that alone*, has control; not only as regards the kind of power acting upon the nerves, but also its influence on this particular system of nerves. (*See Cases* 3, 4, 5, and 6.)

To sum up, then:—It is quite clear from the important and interesting experiments made by Wilson Philip, Legallois, and Flourens, that neither the brain nor nerves of the spine have anything to do with the circulation of the blood; as it will be seen that the animals lived for some time and the circulation went on

* See Cases 1 and 2 at the end of the Treatise.

with vigour after the brain and spine had been removed separately and also conjointly.* It is self-evident, then, that it is to the sympathetic (and that alone) that we must look for regulating the arterial system. And it will be observed that in all parts of the animal body where large and sudden supplies of blood are required, such as the heart, stomach, bowels, and organs of generation, we have the sympathetic or ganglionic system very fully developed, and, as far as I can judge, in ratio to the amount of blood supplied to the several organs; on the contrary, in some parts of the body, and in the extremities where the flow of blood is more regular and not subjected to those *sudden calls* for *large supplies of blood* at *irregular periods*, we find this nerve manifestly decreasing in size; and, indeed, as far as we can judge with the naked eye, ceasing altogether in some parts. Still I perfectly agree with Sir Charles Bell that it *is* distributed all over the body;

* " 1.—Je pris un lapin adulte; je détruisis d'abord la möelle lombaire et la " möelle dorsale jusqu'à l'origine de la dernière paire intercostale; j'ouvris alors " la trachée-artère; j'adaptai la canule d'une seringue à insufflation à cette " ouverture, et l'insufflation fut commencée du moment ou commença la destruction " de la möelle costale.

" La möelle cervical, la möelle allongée, toute la masse cérébrale furent " ensuite successivement détruites.

" L'insufflation se continuait, et la circulation persistait toujours.

" Une heure après, les carotides battaient encore avec force; l'artère crurale " même ayant été coupée donna du sang rouge par jets sensibles.

" 2.—Je détruisis, sur un gros canard, sur un jeune coq, et sur une forte " poule, toute le systême cérébro-spinal à la fois.

" La circulation, soutenue par l'insufflation, survecut une heure dans le " premier de ces animaux, et plus d'une heure et demie dans les deux autres.

" La circulation survit donc un certain temps à la destruction totale du " systême nerveux."—*Flourens, Du Systême Nerveux*, pp. 217—219.

but whether its influence is confined to regulating the small arteries which supply the coats of the vessels, or whether the same influence is continued by it over the whole circulating medium of the extremities and other parts that it manifestly has over the abdominal viscera, must, I fear, be left to a more enlarged inquiry. Moreover, a widely extended series of experiments will be required, as I confess those which I have up to this time instituted have not been sufficiently conclusive to justify my giving a very decided opinion. I will own that, reasoning from analogy, I have long been of opinion that the influence of the sympathetic in regulating the arterial system extends *all over the body*, and an experiment which I recently tried in conjunction with a learned and scientific friend, went very far to strengthen that opinion, as also to change that of my friend.* I should have much doubted my own observation alone with my pre-formed opinion, but as my friend was directly opposed to me, it gives it greater weight.

The great mistake that has been committed in our attempts to ascertain the function of this system of nerves, appears to me to have arisen from supposing it was destined to perform so many different offices, when we know that all the other nerves of the body carry on each its *separate* and *distinct* function. I cannot see how we are to expect this nerve to perform, as Bichat says, "those thousand secret operations of a living body," nor do I perceive the necessity for attaching to it so many different and opposing functions, if we can establish the fact that this system of nerves does perform the *single* function which I have stated by affording the requisite supply of blood. It will not, I

* See Note D, at the end of the Treatise.

think, be expecting too much of the several organs to which it is the means of the blood being conveyed according to its irregular wants, and at the proper periods, that they, by their particular conformation, be able to carry into effect digestion, micturition, or any of the other necessary processes of the animal body. We have in the purely vegetable world many analogous processes going on, where the nervous system does not exist at all, and where heat and light do for the plant what I contend this system of nerves does for the animal, that is, supply it with the materials necessary for the carrying on such processes.* Should this prove to be the case, it will certainly tend greatly to simplify the matter, and thereby bring it much more in accordance with the laws of nature in general.

In conclusion, I have to lament that in breaking this new ground I have not been able to afford that connected proof of my proposition, which longer personal experience and the assistance of other labourers in the field of science may yet supply; but it will be allowed, I trust, that my opinions, though not entirely proved by experiments, which indeed the subject appears to render exceedingly difficult, are supported by a chain of deductions from acknowledged facts, the links of which are unbroken.

* "The activity of vegetative life manifests itself, in vegetables, with the "aid of external influences; in animals, by means of influences produced within "their organism. Digestion, circulation, secretion, are no doubt under the influence "of the nervous system; but the force which gives to the germ, the leaf, and the "radical fibres of the vegetable the same wonderful properties, is the same as "that residing in the secreting membranes and glands of animals, and which "enables every animal organ to perform its own proper functions. It is only the "source of motion that differs in the two great classes of organized beings."—*Liebig, Animal Chemistry*, p. 4.

NOTES.

A.

The more immediate cause of recurring to the study of this important subject (in the midst of my professional avocations) has been a close and anxious attendance upon an interesting little child, the son of esteemed and much valued friends, Dr. and Mrs. P.; a case in which, after absolutely keeping the child alive for a fortnight by purely artificial means, we had the mortification of seeing him sink into the grave, without a single symptom of disease organic or functional, if I except a suspension of the assimilating powers of the stomach, which nothing appeared to have the power to rouse, arising from either disease in the glands more immediately concerned (of which dissection showed not a trace), or, as I believe, from a total loss of power in that branch of the sympathetic nerve which supplies the stomach. But here again dissection did not assist us; hence the difficulty of judging, only by inference. In a very close examination of the body, nothing like disease could be detected; the only remarkable thing was a very strongly developed brain; in fact, the child was extremely precocious; and it obviously occurs, was not the nervous

power that should have been employed on the sympathetic, too much engaged on the brain, favouring greatly my opinion of a sort of derivative power in the nerves, which it will be seen I have broached in this work.

And surely we have here a land-mark to point out to us the way, how earnestly we should condemn the fatal practice too often pursued of stimulating the already too much excited brain of clever or precocious children; how carefully we should inculcate the necessity of attending to the bodily health in children for the first few years of their life, and leaving the cultivation of the mind until it can be done with safety to the body.

Few of us but recollect the deep interest and anxiety with which we have watched these interesting little patients sink into a premature grave, from diseases brought on by this pernicious practice, and this too often to satisfy the vanity of thoughtless parents, or arising not unfrequently from the stimulus of interest on those who have the care of infants at an early age, when much credit is allowed for thus over-cultivating the intellect at the expense of the body.

B.

In illustration of this remarkable difference between the two orders of ganglia, and to do justice to a distinguished foreigner, I wish to notice the extraordinary perversion which Sir Charles Bell makes as to the original and clear views that Bichat

has taken of the whole nervous system. In order to do this and place the matter in dispute fully before the reader, I have quoted him at full.

" We must speak of Bichat with the respect which is due " to a man of genius; he possessed ingenuity, industry, and " eloquence. It was his eloquence, united to an indifference for " the authorities in anatomy and the extraordinary condition of " Europe at the time of his publication, that overpowered the " physiologists of the continent, and by this misconceptions " were entertained as to the relative importance of the parts of " the nervous system. Nothing it appears would suit the " commencement of the French revolution but the entire " overthrow of former systems and the substitution of a new " theory. It was the pleasure of Bichat to divide the nerves " into two distinct systems instead of the one uniform system of " the ancients, in which the nerves were supposed to proceed " from the sensorium as a grand centre, and from that to derive " their power. One of his nervous systems he conceived to have " its centre in the brain, consisting of the nerves destined to " receive impressions, and of the nerves which convey the " influence of the will to the muscular system. The other had " many centres. The power of his last system emanated from " the ganglions, which he observed largely scattered among the " viscera; and each ganglion he conceived, with the authorities " above, though he was far from acknowledging such authorities, " to be a distinct source of nervous influence, whilst a relation " was preserved between them by connecting nerves. The first

" was, according to this author, the nervous system of the animal " life, having one centre in the brain, to which sensation is " propagated, and from which motion proceeds; whilst the " second system was for organic life, had many distinct centres " and many functions relating to the operations of the animal " economy, over which the mind had no power.

" This bold invention was supported by many curious " instances, and its author exhibited much knowledge as well " as ingenuity: but it was anatomically incorrect, and nothing " more clearly evinced the wrong methods of study prevailing " on the continent than the acquiescence and approbation with " which this system was received there. Two errors pervaded " the whole, which ought not, for an instant, to have been left " undetected. The first was in screening from himself what he " could not be ignorant of—that the cerebral nerves also have " ganglions; that thirty-one pairs of large ganglions, in regular " order, and carefully protected, like important organs, are to be " found in the nerves of the head and spine. This at once should " have caused the rejection of the name of ganglionic system of " nerves, given to his nerves of organic life. But his error was not " merely the misapplication of a name: there was misconception " and radical error throughout the whole system. Although " Bichat's ganglionic system was presented with the aspect of " novelty, there was, in truth, no actual discovery. Anatomists " had already convinced themselves that the sixth nerve was not " the root of this sympathetic nerve; that a filament so small " could not be the trunk of that system which, expanding into

" larger branches, and furnished with numerous ganglions, was " seen to pervade the whole viscera, and to connect itself with " every nerve of the body. The opinion had been propagated " that it was a system of visceral nerves extending everywhere, " and not depending upon the encephalon.

" But the most remarkable misconception of Bichat was in " imagining that he saw, in the ganglionic system, or the " sympathetic system of them, the developement of that series of " nerves which is seen in the lower creatures, thus considering " those nerves which, in them, give sensation and volition, to be " the same system which, in the human body, even by his own " showing, give no token of being either the organ of sensa- " tion or voluntary motion."—*Sir Charles Bell on the Nerves*, pp. 8, 9, 10.

Now there appears to me no reason for this severity. Nerves for sensation, nerves for motion belong to the brain and chord, according to Sir Charles Bell's own showing; and wherefore denounce Bichat for saying that the sympathetic is a visceral nerve, and object to his calling it the ganglionic system? It is not fair to say that " he *could not be ignorant*" that the spinal nerves had also ganglia, because, as Plate II. shows, those ganglia were quite a different sort from those found on the sympathetic or true ganglionic system. It is true that he formed a misconception as to the identity of the sympathetic with the nerves which give sensation to the lower order of animals, but he shared the mistake with all his contemporaries.

There is another point. Sir C. Bell himself makes some

confusion as to the sympathetic, in regard to its uniformity. What he says of the regular appearance of the spinal nerves and ganglions is quite correct; but if he intended to assert the same of the abdominal nerves, my own dissections fully bear me out in following Lobstein, who states exactly the reverse.—*See Bell on the Nerves*, pp. 1 and 2.

C.

The idea is generally prevalent that the immediate contact of a substance with muscular or contractile parts is sufficient to induce their action without connection with ganglion, cord, cerebrum, cerebellum, or any nervous centre. This is true of the mere contraction of fibres, as in the muscle of an eel or snake. That may be dissected from all other parts, and yet irritated to action by the mere application of the scalpel. But this respondence to stimuli will not assure any *regular order* in the movements of a part. If the presence of food in the duodenum excites its peristaltic action, that action to be effective must be attended with some relaxation of the superior portion of the bowel. Now that alternating or vicarious action of the intestinal contractile fibres can only be duly regulated by a nervous influence: in the same way as in the voluntary system, the flexors would not act unless the extensors relaxed, and vice versâ.

Now the previous notion has been admitted as a truism by Dr. Marshall Hall, one of the most distinguished authors in this field of inquiry; but I propose to show some reasons against it. I shall, however, make a full quotation, that I may run no danger of misrepresenting anything he intended.

" There are in the animal economy four modes of muscular " action, of muscular contraction.

" The *first* is that designated *voluntary;* volition, originating " in the cerebrum, and spontaneous in its acts, extends its " influence along the spinal marrow and the motor nerves, in a " direct line, to the voluntary muscles. The *second* is that of the " respiration: like volition, the motive influence in respiration " passes in a direct line from one point of the nervous system to " certain muscles; but as voluntary motion seems to originate in " the cerebrum, so the respiratory motions originate in the medulla " oblongata: like the voluntary motion, the motions of respiration " are spontaneous; they continue, at least, after the eighth pair " of nerves has been divided. The *third* kind of muscular action " in the animal economy is that termed *involuntary:* it depends " upon the principle of irritability, and requires the *immediate* " application of a stimulus to the nervo-muscular fibre itself. " These three kinds of muscular motion are well known to " physiologists; and I believe they are all which have been " hitherto pointed out. There is, however, a *fourth*, which " subsists, in part, after the voluntary and respiratory motions " have ceased, by the removal of the cerebrum and medulla " oblongata, and which is attached to the medulla spinalis,

" ceasing itself when this is removed, and leaving the irritability " undiminished. In this kind of muscular motion, the motive " influence does not originate in any central part of the nervous " system, but at a distance from the centre: it is neither " spontaneous in its action nor direct in its course; it is, on the " contrary, excited by the application of appropriate stimuli, " which are not, however, applied immediately to the muscular " or nervo-muscular fibre, but to certain membranous parts, " whence the impression is carried to the medulla, *reflected*, and " reconducted to the part impressed, or conducted to a part " remote from it, in which muscular contraction is effected."—*Dr. Marshall Hall, Phil. Trans.* 1833, p. 638.

It is here clearly stated that the third kind of motion owns no other law than the application of a foreign substance to its immediate surface. How, then, does it happen that sudden blows or lightning paralyse all this immediate action, even when the injury is at a remote part of the canal?*

Now, I conceive that the sympathetic is fully competent to perform the vicarious action alluded to, and that its close position and relations clearly point out that it can exist for no other purpose—that suppose the stomach to be filled with food, a flow of blood takes place into this viscus from the influence of the sympathetic on the gastric arteries, and this increases secretion

* A man had a kick from a horse; it burst part of the colon; he died; nothing he had taken had passed the stomach. If mere contact were sufficient for action, the ingesta should have been found at the seat of injury. It appears, then, to speak comparatively, that the blow had paralysed the abdominal nerves.

and contraction. This contraction over the nervous force is then directed to the duodenum, and so on through the whole intestinal canal, the liver, pancreas, &c.

D.

A horse was killed by dividing the medulla in the French way, the bowels turned aside, and the branch of the sympathetic nerve which joins the ischiatic laid bare; also one of the arteries in the leg. A wire applied to the positive pole of a galvanic battery defended with sponge applied to the nerve, and the negative wire to the artery: the positive wire was then drawn slowly along the plates of a 50-plate battery, and the effect certainly was not only to reproduce the pulsation in the artery, but also clearly to excite circulation in the more minute vessels; so that, as far as a *single experiment* can be depended upon, this goes far to favour the idea that the sympathetic does extend its influence on the arterial system all over the body. Still, as I know the great difficulty of carrying out these kind of experiments satisfactorily, and how different the results of the same experiments have been when made by different individuals under precisely similar circumstances, and made by the most scientific men, I should not be inclined to depend very much upon a single experiment, however skilfully and carefully performed. I should

mention, however, that there were persons present who had no theories on the subject, and who could have no prepossession for one opinion or the other. One of the knacker's men said, "See "how that *pipe* beats when they put on those wires;" and the rest of the men expressed themselves satisfied as to the fact.*

* Experiments of a similar nature were afterwards repeated with the same results.

CASES.

With the prevailing opinion as to the nerves acted upon by strychnine, and its particular action on those nerves, I confess I should be totally at a loss to account for its effects in the following cases. I have been long impressed with the idea that it does act and that powerfully on the sympathetic system, and through that on the stomach, bowels, uterus, the organs of generation, &c. In this way we have at once a solution to the results in the following cases.

CASE I.

Mr. S——, aged 36, not married, had been for years under my care occasionally with affections of the liver and stomach, and great tendency to take cold upon slight occasions. After bringing him round from one of the attacks, I told him I thought he had better marry, that it might produce a beneficial change on his bodily health through the influence of his mind. His answer was that he should be but too happy if he dared do so. This led to an explanation, when he said that unfortunately he had lost all power for years. With the views I then had of the influence of this medicine on the sympathetic, and well knowing the perfect inefficiency of all other known means, I determined to try the effect

of the strychnine ; I am happy to say the results were such as in a short time to satisfy his scruples, and to enable him to marry with comfort, and with a great and manifest improvement in his general health.

CASE II.

An officer in the army, aged 57, had seen a good deal of service, and indulged considerably in wine and women, but more particularly the latter; consulted me about some dyspeptic symptoms which readily gave way to the proper means with an abstinence from stimulants for a short time. Upon seeing him casually some time after and inquiring how he got on, he said as well as ever, with one exception, but he supposed it was one of the monitors of old age. Upon inquiry I found this annoyance arose from his inability to indulge in his usual gallantries. I told him I feared it was rather the effects of his having indulged too freely than the consequence of old age. Having before my eyes the effects of the strychnine in Mr. S——'s case, I determined to try it here; the effect in this case was also perfectly satisfactory. I select these two cases from several others in my note-book, as showing that this medicine has in some way, direct or indirect, a powerful effect upon several of the organs over which I contend the sympathetic, *and that alone*, has control. In the one instance,

whatever the debilitating cause may have been, it certainly was not that of over-excitation: in the other it was clearly one of those cases of debility or loss of power dependent on over-stimulation of the parts. I am aware that many conceive that the good effects here, as well as elsewhere, arise from improving the general health, or through the influence on the spinal nerves; to this opinion, however, I cannot accede, as in both these cases the apparent improvement was too immediate, particularly in the long standing case of Mr. S——.

CASE III.

Miss P——, aged 18, suffering from amenorrhœa, had been under medical treatment for several months, had menstruated a few times slightly at long intervals, but not at all for ten months. Fancied she took cold at that time by standing on damp grass with very slight shoes.

Her present appearance.—Well-developed; countenance pale and yellow, with swellings about the eyes, headache, great weight in the loins, legs and feet swollen, pulse slow and feeble, intermitting every twelve beats; spirits exceedingly low, with the greatest disinclination to exercise; much tenderness over the region of the uterus. Ordered her to take a mild aperient to evacuate the bowels. This to be followed by the use of the strychnia. To call that day week.

Upon making her appearance at the time appointed the amendment was so great as to induce me to mistake her for her sister. The skin had lost its discolouration; pains and swelling had gone; she had menstruated freely; the bowels were regular, and appetite good; in fact from this time she became quite well, not having another unpleasant symptom.

CASE IV.

Mrs. W—— sent for me to her daughter, aged 27, who had been delicate all her life, did not menstruate until very late, and then most irregularly, often with intermissions of from three to six, and sometimes twelve, months; had been under nearly constant medical treatment.

Present appearance.—Much emaciated, peculiar drooping of the figure, round shouldered, with the arms dropping by the sides, almost amounting to deformity; the countenance pale yellow, nearly approaching to a green tinge, the skin giving out a kind of fishy odour, appetite entirely gone, except for things of the most fantastic kind, such as lime, chalk, &c.; constant headaches, palpitation of the heart, hysterical upon the slightest occasions, constant teazing cough, weight in the loins, pendulous and extremely tender abdomen, legs and feet much swollen, bowels always constipated, spirits very much depressed, with constant

dread of some frightful misfortune; pulse quick, small, and irritable.

Treatment.—To take a gentle laxative dose of medicine to evacuate the bowels, to be succeeded by small doses of blue pill for three days, the laxative repeated to empty the bowels freely, to commence with the strychnia. From this time the amendment was truly extraordinary; she menstruated within the week, with a gradual subsidence of all the distressing symptoms; the skin regained its proper colour and odour, the swelling in the abdomen and lower extremities subsided, the appetite and bowels became natural, headaches, palpitation, and hysteria gone; gaining flesh daily, the figure recovering its proper tone and proportions. In fact the change altogether was so great as to call forth the attention of every one; nor has she had any return, but enjoys excellent health.

CASE V.

Miss S——, aged 18, had enjoyed pretty good health up to this period, rather inclined to be stout, menstruated regularly, with three exceptions, each time the result of taking cold, on which occasions the menses were suspended for several months, when recourse was had to medical advice; suffering the customary symptoms, which yielded to the usual treatment applied on each occasion for about five or six weeks.

Treatment.—She took a mild aperient at bed time. Next day I applied a very slight galvanic stream from the nape of the neck to the fossa navicularis to be continued for fifteen minutes; omitted this one day; used it the next for twenty minutes. She did not require any further application, as she menstruated copiously on the night following the second application, and has had the usual periodical return, and is in all other respects quite well.

CASE VI.

Miss Jane M'D——, aged 17, an exceedingly lax-fibred pale-complexioned girl, labouring under all the worst symptoms of amenorrhœa, never having menstruated regularly, or in sufficient quantities.

Treatment.—I gave an aperient to empty the bowels, and then applied the galvanic influence as in the last case. She menstruated slightly while under the third operation of this kind. Great improvement took place in the general health. I directed her to use constant horse-exercise, clothe the extremities well, and apply plenty of cold salt and water over the person every morning, to take light nourishing diet, and to submit to the use of the galvanic battery at the periodic times, until menstruation was properly established. This was twice resorted to, very slightly, when the patient became in all respects perfectly restored.

In selecting the four preceding cases of amenorrhœa from some others, I propose to shew thereby not only the effect of strychnia, but also that of galvanism on another important organ over which I believe the sympathetic exercises the same influence which I have assumed it to do over the other organs of generation. It is worthy of remark how very similar the effects of these two remedies are in cases of this kind. It is by no means an unfrequent occurrence for menstruation to take place while the patient is being operated upon by galvanism; the same thing also occurs while under the influence of a single dose of strychnia. The effects here then would appear to arise from the power of these remedies to determine *through the agency of the sympathetic nerve* a large supply of blood at once to the uterus, and not by any secondary or remote effect. But rather than go on multiplying cases from my own note-book, I shall prefer shewing that, independently of the foregoing results in my own practice, I have found other medical men who having adopted the same ideas have afforded me testimony of similar results. From these I have selected the following, as shewing the effects of strychnia on the stomach and bowels, also as containing much that is otherwise interesting. For the first I am indebted to my friend Dr. Price, and for the others to another friend, a surgeon to one of our large metropolitan hospitals.

CASES VII. AND VIII.

Gloucester Cottage, Brixton,
December 28th, 1843.

DEAR PROCTER,

As you have expressed a wish that I should state what I have found to have been the effects of strychnia in cases of constipation, I beg to state that I gave it to a lady, about two years ago, in the forty-third year of her age, who had from the age of seventeen, suffered more or less severely, during the intermediate periods, from constipation ; it was not an unfrequent circumstance that she would have no alvine discharge for two or three weeks, and sometimes longer, and yet partake heartily of food daily : during the whole period, many days would elapse between one discharge and another ; and frequently she was compelled to take strong purgative doses, and even repeat them, before she could obtain relief; and sometimes enemas. The feculent matter evacuated would not then exceed *much, if at all, in quantity* what might ordinarily be expected from a person whose bowels had not been subject to constipation, of more than a day or two's standing. The effect of the strychnia has been a daily alvine evacuation, with but little interruption ; when this has happened, an ordinary dose of aperient medicine has had the desired effect ; even simply two grains of calomel. She has, at long intervals, occasionally taken a purgative, but not because of constipated bowels ; and also an occasional aperient, under such circumstances as would induce other

persons to do so, the alvine discharge not having passed off freely, and affording satisfactory relief.

I beg to add that I have perceived the same effects in very many other instances, where the bowels have been induced to perform their functions daily, and these effects have continued for a longer or shorter period, requiring afterwards, in some instances, to take a little aperient medicine, as would be the case with persons not habitually costive. In a case, a few days ago, of a female whose bowels had been at all times constipated, I was compelled to repeat the strychnia; about four or five months before she had been very effectually relieved by this medicine; the necessity for this visit arose, by her own admission, from inattention to natural calls, and other circumstances. I should remark here that she has been married for several years, but she has never been pregnant; she never menstruated freely till after taking the strychnia: this is also a very frequent good effect of the administration of this medicine.

I hope this note, written in a great hurry, will convey to you clearly all you require.

I remain, dear Procter,

Very truly yours,

J. Price.

To Dr. Procter, Stockwell.

Dear Procter,

The following three cases I have selected, according to your wish, as exhibiting the effects of strychnia in a marked degree.

Faithfully yours,

CASES IX. X. & XI.

W. S. had frequently been under my care for dyspepsia, attended with asthmatic cough. There was so little relief afforded by ordinary means that I determined to give the strychnia, in order to try if stimulation of the nervous system might have any effect. In prescribing it, either through my own bad writing or the carelessness of the chemist, it was made double the strength of what I intended. The patient moreover having other pills also to take of an aperient nature, took from the wrong box, and thus doubled the dose. It was, in fact, therefore *quadrupled.*

The consequences were remarkable; he did not experience the twitching usually attending a full dose of strychnia, but was affected with a curious wandering in his head, much vivacity of speech, and an uncontrollable inclination to walk about; he could not be induced to sit down and converse quietly for half a minute.

The remedy was abandoned for a day or so, and afterwards resumed in proper doses; and I am happy to say with the most salutary effects; his appetite returned, his respiration and cough

became better, and he was able to resume his usual active employment.

Mr. S., widower, and father of several children, attached himself to a second wife, whom he had long been desiderating. His affection for her was ardent, nevertheless he found himself, as regarded her, altogether impotent; and although under these peculiar circumstances one might have presumed that medicine would not have produced a restoration in a case so purely dependent on mental causes, yet the exhibition of a few doses of strychnia was attended with the happiest results.

Jane P. engaged in a shop during many hours of the day, became subjected to what is usually called *bearing down*, with a discharge familiarly termed *whites*. After much trouble and difficulty her mother persuaded her to have the proper means adopted to ascertain the exact nature of her case. It proved to be relaxation of the ligaments of the uterus, a disease very common in middle-aged women, and also occurring occasionally in young unmarried females, as in the present instance. The usual remedies having been persevered in for a period without the desired results, recourse was ultimately had to strychnia; this medicine very speedily removed all unpleasant symptoms, and produced a great improvement in the general health.

CASE XII.

I am induced to give the two following cases as showing the effect of strychnia in spasmodic asthma combined with dyspepsia.

Mr. W. E.——, aged 54, of spare habit, had laboured under asthmatic cough and difficulty of breathing for the last eighteen years, which was increased to a distressing degree in damp or foggy weather; the general health had been pretty good until within the last six months, during which time he had suffered much from dyspepsia and bilious attacks, with irregularity of bowels. He had now become very desponding about himself.

Treatment.—To take a mild aperient, succeeded by small doses of blue pill, ipecacuanha, and morphine; at the end of four days repeated the aperient; at this time much benefit was experienced in the general health, but the cough and difficulty of breathing little relieved. To commence the strychnia; the second dose gave considerable relief; in a week the cough was gone, and the breathing become natural. The patient then (and upon several occasions when I have seen him since) declared he had not had so much comfort or enjoyed such good health for eighteen years, and that he felt nothing at all of his old complaint but in very bad weather, and then but slightly.

CASE XIII.

Miss Jane C——, aged 20, had lived in the country until within the last three years, where she had enjoyed excellent and undisturbed health; was stout, and of a florid complexion. At this period she came to reside in London. Her health soon after gave way, and she suffered more or less with dyspepsia and hepatic derangement, coupled with asthmatic cough and difficulty of breathing; this had increased very much within the last few months, so that she could not ascend the stairs without stopping to recover her breath several times; she had also violent palpitation of the heart; had menstruated regularly, but in small quantities; her present appearance was that of a person suffering much from amenorrhœa, exceedingly pale, with dark circle round the eyes and mouth.

Treatment.—To take an aloetic cathartic, succeeded by the steel mixture with morphia, a generous diet, and gentle exercise. This was continued for a week without much amendment.

Ordered then to take a mild aperient to empty the bowels, and to begin the strychnia. She only took four doses of this medicine when her cough and difficulty of breathing became so much better as to render it unnecessary to continue it. Her general health at the same time improved rapidly. She menstruated more freely, lost the pallid hue of the countenance, and regained in a great degree her florid complexion, and now enjoys very good health, ascending the stairs without the least inconvenience from palpitation of the heart or otherwise.

EXPLANATION OF THE PLATES.

PLATE I.

A portion of the small bowels of a Horse, shewing the mesenteric artery completely surrounded and enmeshed by the sympathetic nerve, with a fibre or two accompanying every branch of the artery, however minute.

PLATE II.

Fig. 1, one of the sympathetic ganglia.

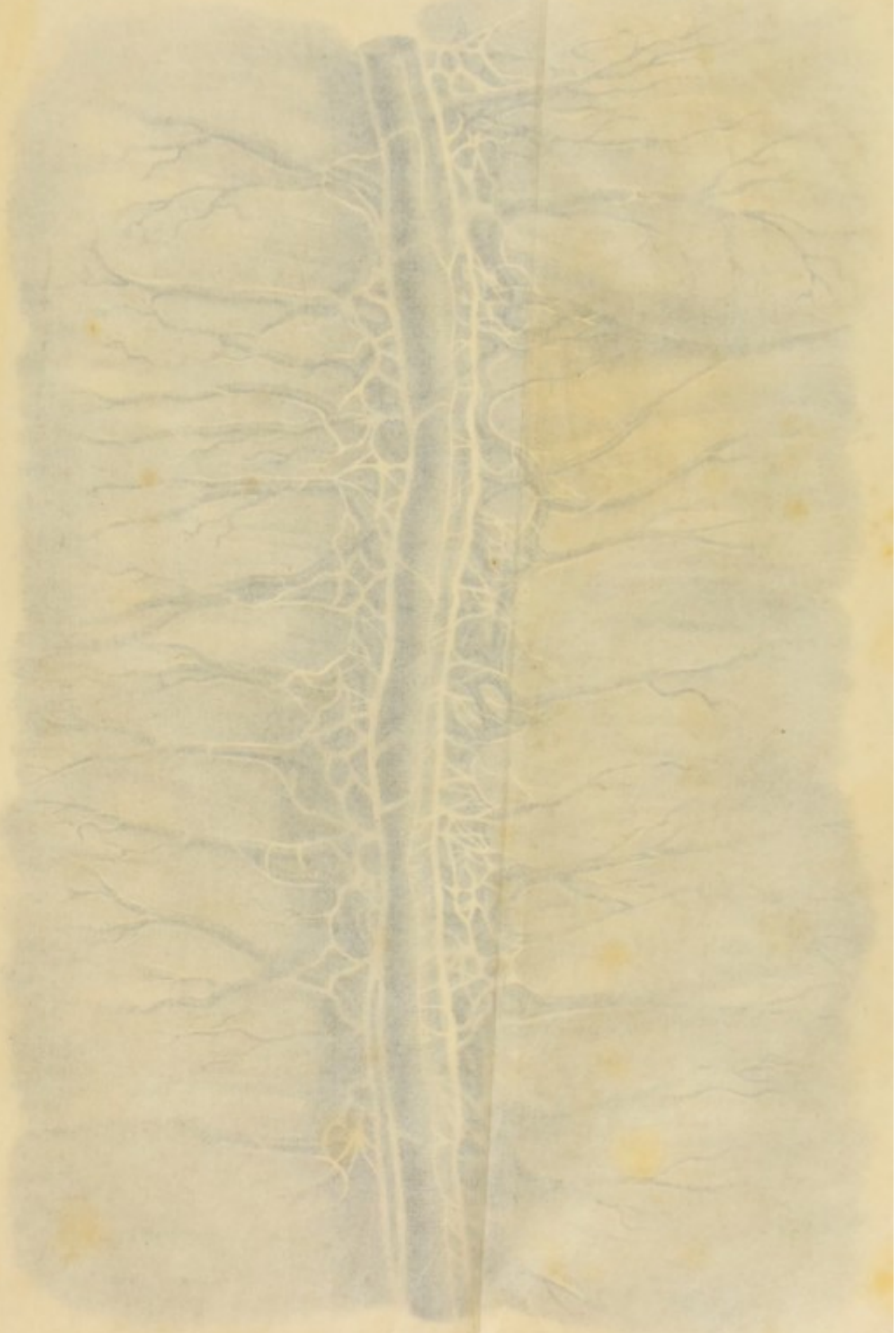
Fig. 2, one of the spinal ganglia.

Fig. 3, a portion of the heart of a Horse dissected out so as to shew a branch given off from the under part of one of the descending nerves, dipping into the muscular texture to join and expend itself upon the arterial ramifications. *(Magnified.)*

Fig. 4, a portion dissected out to shew the terminal branch of a nerve descending to enmesh the extreme branches of the cardiac arteries. *(Magnified.)*

PLATE III.

The heart of a Horse reduced one-third in size and injected, shewing some of the nerves dipping into the muscular texture; others resting on the larger arteries.



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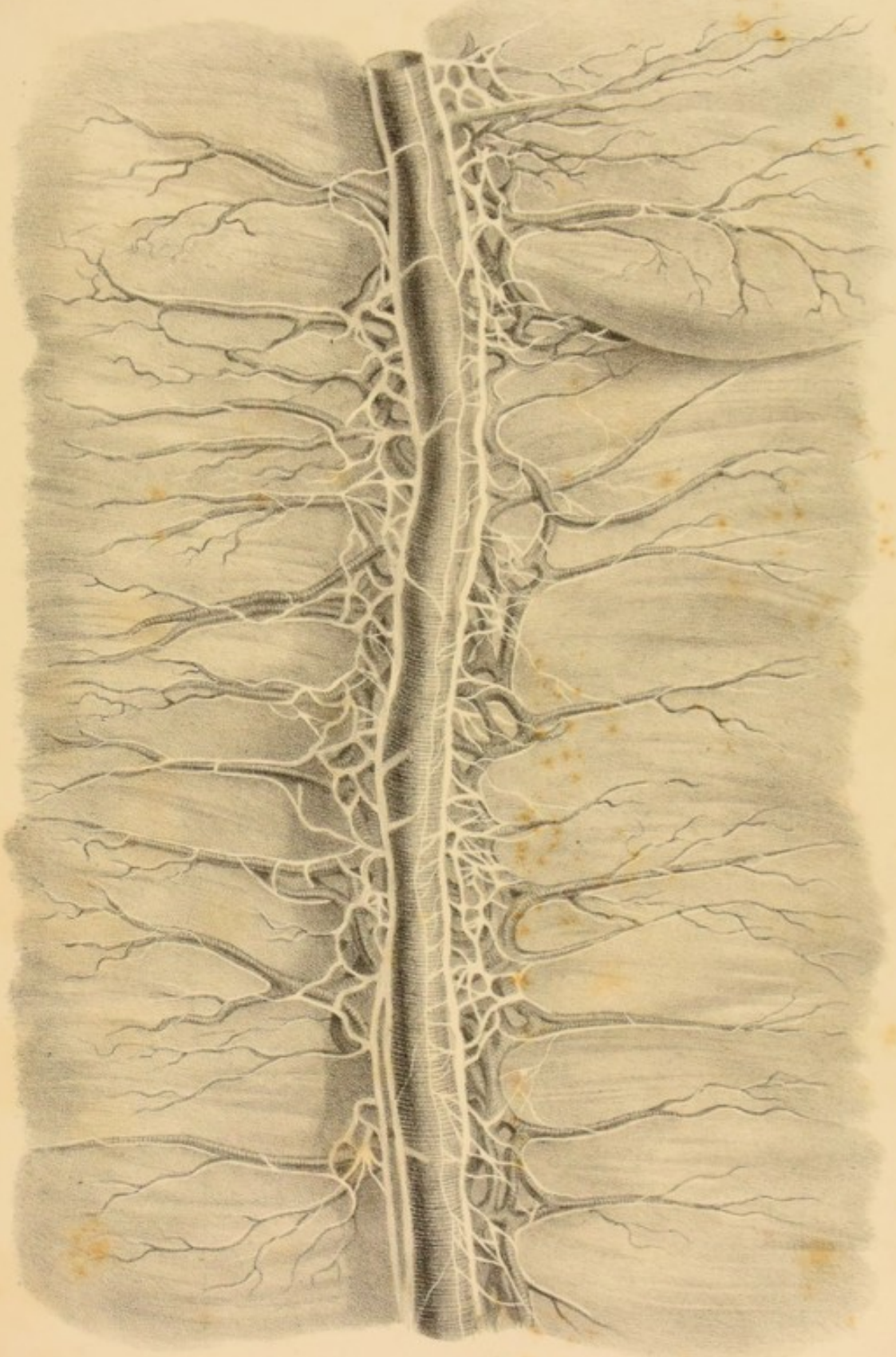

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PLATE II

Fig 1

Fig 2

Fig 3

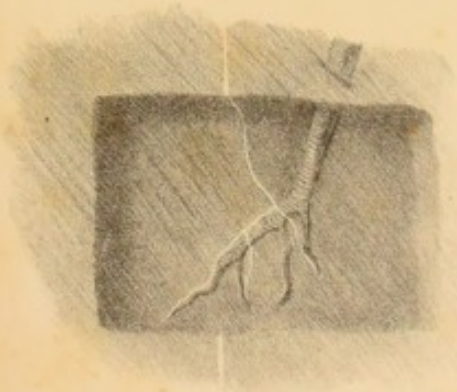
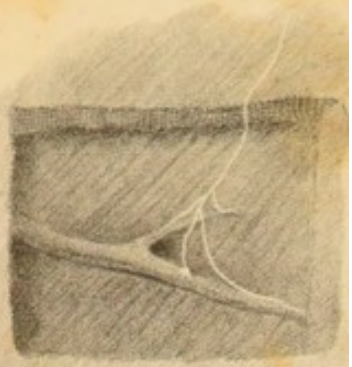


Fig 4



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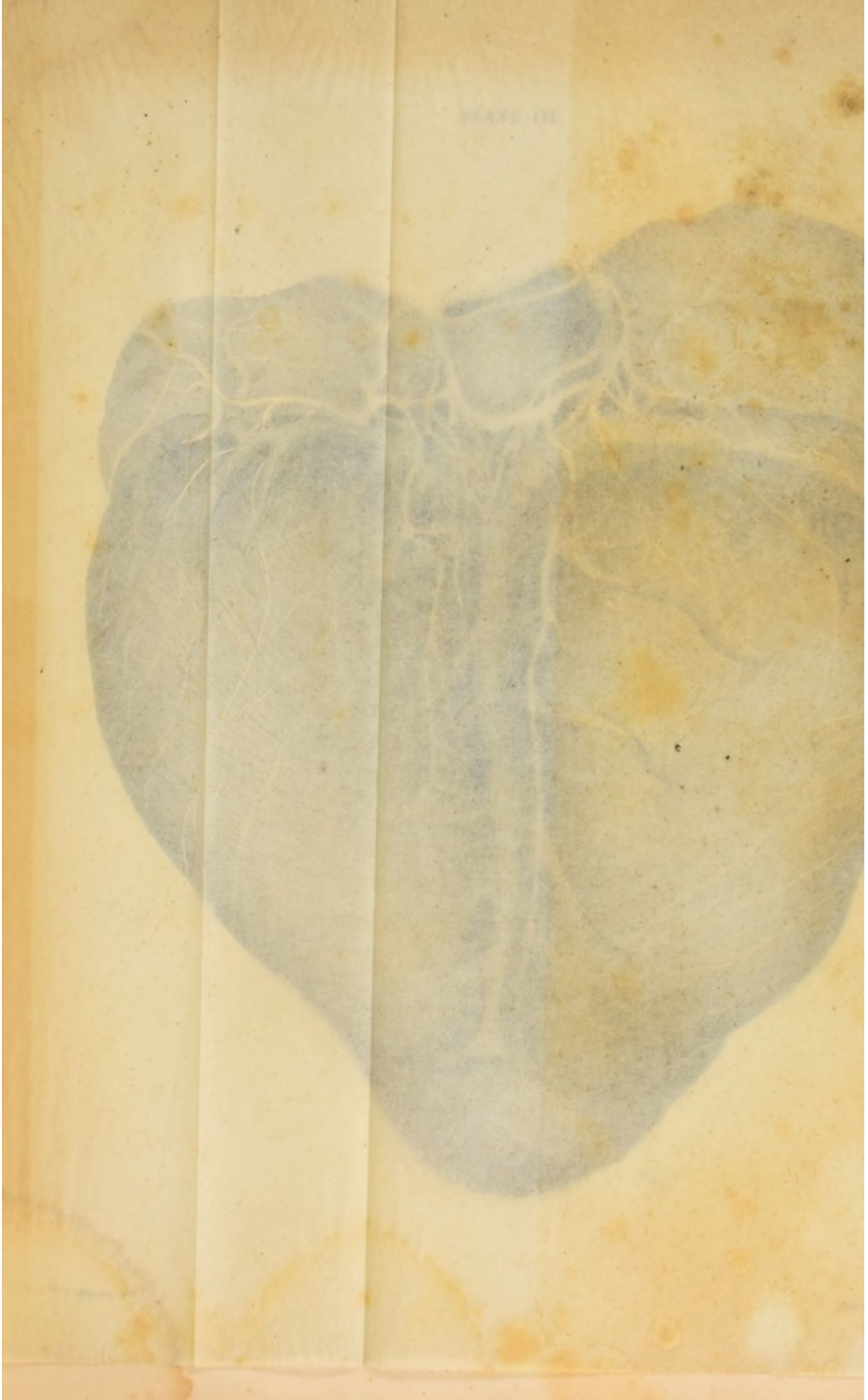

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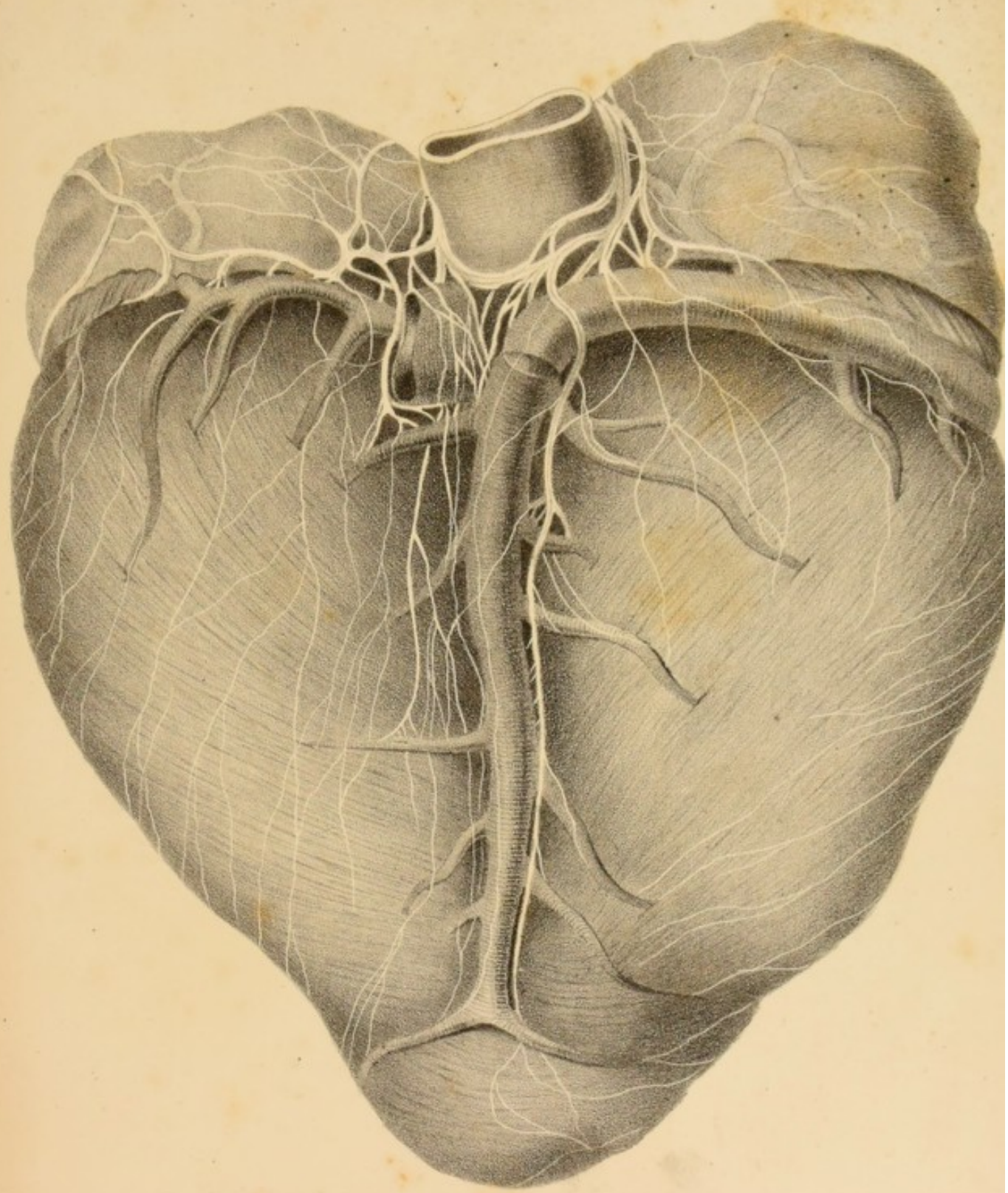

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