A summary of the anatomy and physiology of the placenta / by John O'Reilly.

O'REILLY

ON

THE PLACENTA,

AND THE

PHENOMENA

CONNECTED WITH

THE ANIMAL AND ORGANIC

NERVOUS SYSTEM.

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NOTICES.

From VALENTINE MOTT, Esq., LL.D., M.D., *Ex-President of the Medical Faculty of the University of New York; Emeritus Professor of Surgery in the University of New York, &c., &c.*

MY DEAR DOCTOR—I have read with great pleasure your views of the functions of the Placenta; as far as I can penetrate into this important organ, it appears to me that your views are original and correct.

I congratulate you upon the novelties you have treated us with, not only in relation to this part, but upon the centres and functions of the nerves of organic life.

It appears to me that the more we examine into your views and explanations of the phenomena of organic life, the more we shall have occasion to admire the harmony and originality of your views.

Yours truly,

V. MOTT,

Dr. O'Reilly. ——— 1 Gramercy Park, 21st Street.

Copy of a letter from MARTYN PAINE, Esq., LL.D., M.D., *Professor of Materia Medica in the University of New York; Author of the Institutes of Medicine, &c., &c.*

NEW YORK, *January* 8, 1859.

JOHN O'REILLY, M.D.:

Dear Sir—I cannot express to you my grateful acknowledgment for the kind manner in which you have referred to me in your able article on the Anatomy and Physiology of the Placenta, as contained in the *American Medical Gazette* of the present month.

I have read that article not only with great interest, but instruction; it is something that will last. What you have said of the inter-communication of nerves between the mother and fœtus is a great fundamental fact; it is probably full of physiological import; and although I have been always skeptical about the supposed influence of the mother's imagination in producing physical changes in the fœtus, yet I have not doubted that strong mental emotions may propagate upon it a temporary nervous influence, and your reference to the case of Elizabeth is a very happy illustration of the fact, while, at the same time, you have thus supplied a very forcible proof of the truthfulness of that remarkable narrative; for, in expounding that phenomenon by a great and recondite physiological principle, it carries an important weight to all the other details. Your other citation of the death of the fœtus, after the mother has sustained a mental shock, is also strongly to your purpose. There is great sagacity in the inference which you have derived from your anatomical premises, that "the organic nerves effect the depuration of the blood in the placental lobule;" that is, the conversion of venous into arterial blood. Should this prove to be true, it would not only have been a great inductive process, but will contribute much towards a right philosophy of the functions of the nervous system; it is certainly well sustained by late experiments of Bernard upon the nerves supplying glandular bodies, by which he has shown that the nerves exercise the controlling influence upon the color of the blood in those bodies which you attribute to the nerves in the "placental lobule."

Very truly and respectfully yours,

MARTYN PAINE.

From W. H. PORTER, Esq., A.M., M.D., *Professor of Surgery R.C.S., Ireland; Senior Surgeon to the Meath Hospital and Co. Dublin Infirmary; Ex-President R. C.S., Ireland.*

21 KILDARE STREET, DUBLIN, *April* 16, 1860.

MY DEAR SIR—I have received the April number of the *American Medical Gazette*, which contains an interesting article on the Nervous Centres of Animal and Organic Life, written by you, and for which I suppose I am indebted to your kindness and attention. I have perused it most carefully, and can most truly say have derived from it equal pleasure and advantage; it is a part of our professional literature that has been too much neglected; and as it now seems likely to attract attention at your side of the world, it gives me great pleasure to see the movement headed by a Licen-

With Compliments

A SUMMARY

OF THE

ANATOMY AND PHYSIOLOGY

OF

THE PLACENTA.

By JOHN O'REILLY, M.D.,

Licentiate and Fellow of the Royal College of Surgeons in Ireland; Resident Fellow of the New York Academy of Medicine; Member of the Medico-Chirurgical College of New York; late Medical Officer to the Oldcastle Workhouse and Fever Hospital, Ireland.

In order to demonstrate that the organic nerves surrounding the maternal uterine arteries inosculate with the organic nerves surrounding the hypogastric arteries of the fœtus, thus establishing a nervous communication between mother and child, it becomes necessary to study the anatomy of the placenta, by its analogy to other organs, as well as the comparative anatomy of the invertebrata in relation to the organic nervous system.

1. That the placenta resembles a conglomerate gland.

2. That the placenta bears a very strong resemblance to the *liver* in its anatomical organization and its function.

3. That the placenta is composed of four sets of vessels, connected together by cellular tissue.

4. That two sets of vessels enter the placenta in large trunks—namely, the maternal uterine arteries, which convey the arterial blood from the mother to the placenta; and the hypogastric arteries, which carry back the blood to the placenta, after its circulation in the fœtus.

5. That two sets of vessels commence in capillaries—namely, the umbilical vein, which conveys the arterial blood to the fœtus; and the uterine veins, which commence in capillaries, and proceed directly to

enter the decidua uteri, and discharge their contents into the uterine sinuses, and through the latter to the venous circulation of the mother.

6. That the uterine arteries subdivide into innumerable branches, ultimately terminating in capillaries; and that the hypogastric arteries subdivide into innumerable branches, and terminate in capillaries.

7. That a retinæ of organic nerves encompass and form plexuses round the arteries, sending twigs into their coats, (the uterine artery and hypogastric arteries.)

8. That the organic nerves of the maternal uterine arteries form glands at the capillary terminations of the arteries; and that the organic nerves of the hypogastric arteries also form glands.

9. That the glands formed at the capillaries of the hypogastric and uterine arteries inosculate, and freely communicate.

10. That the blood is arterialized by the combined influence of the organic nerves derived from the mother and fœtus in the placental lobule or gland.

11. That the blood which has been arterialized is conveyed from the glands or lobules by the capillaries to the branches and trunk of the umbilical vein to the fœtus; and that the impure blood is carried back by the capillary maternal uterine veins from the glands to the uterine sinuses.

12. That the four sets of vessels in the liver consist of the hepatic arteries, which are analogous to the maternal uterine arteries; the vena porta, which is analogous to the hypogastric artery of the fœtus; the hepatic veins, which are analogous to the branches of the umbilical veins; the gall-ducts, which are analogous to the uterine veins.

13. That the analogy is still further made more manifest by knowing that the hypogastric arteries contain the impure blood which has circulated through the fœtus, and that the vena porta contains the impure blood which has circulated through the intestines; that the umbilical vein contains the blood which has been purified for the fœtus, and that the hepatic veins contain the blood after having been purified from the bile; that the uterine veins carry back all the impurities of the fœtal blood to the uterine sinuses, and are analogous to the gall-ducts, which convey the impurities of the intestinal blood to the gall-bladder.

14. That the vena porta subdivides into innumerable branches,

and terminates in capillaries; that the hepatic veins commence in capillaries; that the hepatic artery terminates in capillaries; that the gall-ducts commence in capillaries.

15. That the four sets of vessels in the liver are all connected at their capillaries, terminating in the acini or lobules, in the same manner as the four sets of vessels are in the placental lobule.

16. That it is admitted that the liver plays a prominent part in the fœtus as regards the purification of the blood for the fœtus, and in this function resembles the placenta.

17. That the manner in which the uterine veins enter the decidua uteri, to pour their contents into the uterine sinuses, is analogous to the mode in which the cerebral veins enter the dura mater, to discharge their contents into the cerebral sinuses.

18. That the uterine sinuses are situated between the walls of the uterus and the decidua uteri.

19. That the *bruit de soufflet* may be adduced as a proof that the uterine veins pierce the decidua, to pour their contents into the uterine sinuses, inasmuch as this phenomenon is produced by the blood flowing from constricted orifices into expansive openings.

20. That Professor Simpson's operation of removing the placenta, in placental presentation, affords a proof that the uterine veins pierce the decidua to reach the uterine sinuses, inasmuch as its removal cuts off the supply of venous blood from the sinuses.

21. That the blood discharged in placental presentation is of a venous character, showing that it is the product of the uterine veins, which have pierced the decidua to reach the uterine sinuses.

22. That when the placenta is situated over the os uteri, as soon as the latter is dilated to the size of a shilling, there is profuse hæmorrhage. Here the placenta is separated from the walls of the uterus. The placenta can be felt with the finger, and here it is manifest the uterine veins must pierce the decidua to reach the uterine sinuses; the blood, under the circumstances stated, flows from the mouths of the veins directly through the expanded os, and escapes per vaginam; the uterine sinuses being ruptured during the dilatation of the os uteri.

23. That Professor Dalton says it is very easy to demonstrate the arrangement of the *fœtal tufts* in the human placenta. They can be readily seen by the naked eye, and may be easily traced from their attachment at the *under surface* of the chorion to their termination near the *uterine* surface of the placenta. The fœtal tufts are

the maternal uterine veins proceeding from the inner to the external or uterine surface of the placenta, to pierce the decidua, and discharge their contents into the uterine sinuses.

24. That the chorion, which surrounds the fœtal vessels, on their entrance into the placenta, is analogous to the capsule of Glisson, which surrounds the hepatic vessels on their entrance into the liver.

25. That the distribution of the maternal uterine artery, on passing through the placenta to reach its internal surface, is analogous to the renal artery, which passes to the cortical substance of the kidney.

26. That mental impressions made on a pregnant woman are communicated to the fœtus in utero, inasmuch as the animal and organic nervous system of the mother act in concert, whereby the impression is communicated by the mother to the fœtus in utero through the inosculation of the organic nerves of mother and fœtus in the placental lobule.

27. That when it happens that a woman has witnessed a frightful accident befall her husband during the last months of pregnancy, she will give birth either to a dead child, or one who in due time will prove to be an idiot, or suffer from some nervous affection.

28. That Professor Owen's description of the fœtus and appendages of the kangaroo demonstrates that the fœtal vessels terminate as well as commence in capillaries, thus confirming my views relative to the anatomical character of the placenta.

29. That there is every reason to believe that the oxygen of the maternal arterial blood is united with the venous blood of the fœtus by the action of electricity.

A Statement of Dr. John Burk, of Grand Street, N. Y., on the Color of the Blood in Hæmorrhage from the Uterus before or after Delivery.

According to my observation, and I have met with a great number of cases, the blood is of the venous character, like that which is removed by venesection, though frequently much darker.

I remember well the case of a Mrs. Grey, who, being seven months pregnant, was seized immediately after dinner with intense pain in the right side. When I saw her the pain was very severe; the uterus could be felt through the abdominal walls, as hard as a stone. By-the-by, according to my observation, a peculiar stony-hardness of the

womb, attended with intense local pain on either side, and great prostration, are a sure indication of internal hæmorrhage. No dilatation of the os tincæ. She died in 24 hours after the first symptoms of pain.

Post-Mortem.—Placenta on the right side. It was detached about two inches from uterine wall, superiorly; about three pints of dark fluid blood were effused between the uterine wall and membrane.

I have observed in other cases of uterine hæmorrhage dark masses of coagulated blood to come away immediately after the expulsion of the child, and sometimes before it.

Professor Barker, of this city, told me the blood in placental presentation was dark-colored or venous. The observations of Dr. Burk and Professor Barker confirm my views, that the uterine veins pierce the decidua to reach the uterine sinuses, and that the blood must be dark-colored J. O'R

The Connection between the Nervous Centres of Animal and Organic Life.—In order to demonstrate the mode in which an impression made on the mind of a pregnant woman is conveyed to a child in utero, it became necessary to investigate the connection between the animal and organic nervous systems; as for example, the ciliary nerves and the retina, the former connected with the organic nervous system, the latter with the animal nervous system. In studying this abstruse matter, other subjects of great interest presented themselves, which are noticed in the annexed summary, viz.:

Organic nervous system, common to the invertebrata and vertebrata; organic nervous system presides over all the vital functions; cerebro-spinal nervous system not necessary for the maintenance of life; life—how propagated; function of superior central ganglion; spheno-palatine ganglion; cardiac ganglion; semilunar ganglion; arteries surrounded by a retina of organic nerves to the termination of the capillary arteries, where they form glands; veins have no organic nerves surrounding them; functions of pulmonary organic glands; evolution of electricity; proofs to sustain this proposition; reasons for discarding the theory that the blood is arterialized by the process of endosmose and exosmose; union of oxygen with organic nervous glands and ganglia constitutes life; syncope; use of blood; use of oxygen; how fevers are communicated; how syphilis and small-pox are communicated to the fœtus in utero; intermittent fever; explanation of paroxysms—cold, hot, and sweating stages; how water quenches thirst; life an immaterial agent, resembling electricity; immaterial agents act through material agents; organic nervous system can act independently;

animal nervous system can act independently; animal and organic systems can act in concert; examples of their mode of action; excitation of organic nervous retina surrounding capillary artery causes dilatation of the artery; depression causes contraction of the artery; exciting cause of inflammation; phlegmon; chancre; vivisections; animal nervous system; intellectual faculties; development of cerebrum; Camper's facial angle in the orang-outang, Hottentot and European; action of medicines: belladonna; opium; strychnine; croton oil; tobacco; arsenic; cantharides; mercury; tartar-emetic; action of animal poisons; hydrophobia; syphilis; dissecting wound; blood-letting—when it should be practiced; blood-letting—when inadmissible; stimulants—when required; operation of therapeutic agents; cold applications; veratrum viride; tartar-emetic; transfusion; causes of death by hectic fever; cholera; mortification; phthisis; pneumo-thorax; cold; convulsions; scalds; intoxication; (typhus fever;) good effects of stimulants and nutriment explained; tartar-emetic; arsenic; corrosive sublimate; hydrocyanic acid; elaterium; veratrum viride; hæmorrhage; fracture of cervical vertebræ; delirium tremens; tetanus; strychnine; tobacco; dropsy; aneurism; chronic diarrhœa; poisons do not act by absorption; medicines act as antidotes; pathology of hydrophobia.

1. That in the invertebrata there is only one nervous system, known as the vital or organic nervous system.

2. That the organic nervous system of the invertebrata is identical with the organic nervous system of the vertebrata.

3. That the organic nervous system presides over, guards, and regulates the vital functions of the invertebrata, as well as vital functions of the vertebrata.

That Mr. Quain says: "*Now as to the sympathetic nerve, so far from being in any way derived from the brain or the spinal cord, it is produced independently of either, and exists notwithstanding the absence of both. It is found perfectly formed in acephalous infants; therefore, does not arise mediately or immediately from the brain; neither can it be said to receive roots from the spinal cord, for it is known to exist as early in the fœtal state as the cord itself, and be fully developed, even though the latter is altogether wanting. It appears that whilst the organs of vegetation and life are being formed, the sympathetic nerves are produced concurrently with them; and that as the growth of these parts proceeds from the circumference to the centre of the whole body from its lateral parts to the median line, the sympathetic nerves also conform to the general law.*"—See Quain's Elements of Anatomy, p. 711.

4. That the vital agent known as life is imparted with force to the

semen at the moment of its discharge, as is recognized by the shock given to the organic nervous system, and the instant expulsion of the semen cotemporaneously with the shock.

5. That the central superior ganglion (pineal gland) receives communication from the cerebrum, and transmits communications through the brain and animal nerves to other organic ganglia.

6. That the cerebral ganglion (the pituitary gland) presides over nutrition, assimilation, secretion, and absorption in the brain.

7. That the otic ganglion regulates the contraction and relaxation of the tensor tympani muscle, so as to meet the requirements of the mind with regard to hearing.

8. That the lenticular ganglion regulates the contraction and dilatation of the iris, (muscle,) so as to act in accordance with the wants of the mind in seeing objects.

9. That the superior cervical ganglion regulates the contraction and relaxation of the muscles of the larynx, in speaking in a loud or low voice.

10. That the spheno-palatine ganglion presides over the function of selecting proper food, mastication, salivary secretion, deglutition, as well as gives warning that there is an excess of oxygen in the blood, by giving the sensation of thirst and the necessity for water to afford hydrogen to combine with the oxygen, and thus allay irritation of the organic nervous glands by the passage of urine or cutaneous perspiration.

11. That the prevertebral ganglia regulate the contraction and relaxation of the muscles of the trunk and extremities, as is exemplified in leaping to a certain distance, or playing with the fingers on a musical instrument. In both these cases the muscles are so regulated as to meet the wishes of the mind.

12. That the cardiac ganglion is made up of six small ganglia.

13. That the six cardiac ganglia are formed from the three pairs of cardiac nerves, which take their origin from the three cervical ganglia on the right side and three cervical ganglia on the left side, the ganglia being all connected together by slips or bands of communication. (See Harrison's Surgical Anatomy.)

14. That the right auricular ganglion presides over the contraction and dilatation of the right auricle of the heart.

15. That the right ventricular ganglion presides over the contraction and dilatation of the right ventricle.

16. That the left auricular ganglion presides over the contraction and dilatation of the left auricle.

17. That the left ventricular ganglion presides over the contraction and dilatation of the left ventricle.

18. That the aortic ganglion sends a plexus or retina of nerves, which encompass the trunk of the artery, sends twigs into its coats, and are prolonged on its surface.

19. That the pulmonary ganglion sends a retina of nerves, which surround the pulmonary artery, sending twigs into its coats, and are thus continued on all the branches of the artery to their termination in capillaries, where they form organic nervous glands.

20. That the organic nervous glands are situated at the termination of the pulmonary capillary arteries, and give origin to the pulmonary capillary veins. The blood, therefore, has to pass through the gland before it can reach the vein.

21. That the glands are in direct communication with the air-cells, which are analogous to the pores of the skin, which are in communication with the organic nervous glands of the skin. The organic glands in the lungs communicate with the air from within. In the skin, the organic glands are in communication with the air from without; hence the analogy between the skin and lungs.

22. That as soon as the air comes in contact with the organic glands in the air-cells of the lungs, the glands are stimulated, and give off electricity, precisely in the same way as the electrical eel, when stimulated, gives off electricity, which causes the union of the oxygen of the air to unite with the venous blood which is passing through the gland, which, on being thus arterialized, is conveyed from the glands by the pulmonary veins to the left auricle of the heart.

23. That on the union of the oxygen with the venous blood heat is evolved, and a certain amount of electricity, which expels the carbon and hydrogen in the shape of vapor from the lungs.

24. That the semilunar ganglia, and ganglia anterior to it, have each specific functions to perform.

25. That the stomachic or gastric ganglion sends a retina of organic nerves round the arteries, which are distributed to the stomach to their termination, where they form organic nervous glands, from which the gastric juice is secreted, under the guidance of the ganglion.

26. That the hepatic ganglion sends a retina of organic nerves round the hepatic artery and its branches, which terminate in the hepatic lobules, causing the secretion of the bile from the portal blood, under the guidance of the hepatic ganglia.

27. That the pancreatic ganglion sends a retina of nerves round the

pancreatic artery, which forms glands at the termination of the branches of the arteries, from which the pancreatic juice is secreted.

28. That the mesenteric ganglion sends a retina of nerves round the mesenteric arteries, which form glands at the termination of the arteries, from which the secretion of mucus in the intestinal tube takes place.

29. That the renal ganglion sends a retina of organic nerves round the renal artery, which terminates in the corpus malpighianum of the kidney, under whose guidance the urine is secreted.

30. That the spermatic ganglion sends a retina of nerves round the spermatic arteries to the testicles, where, at the termination of the arteries, glands are found, composed of the capillary arteries, capillary veins, and seminal ducts. The semen, therefore, is secreted under the presidency of the spermatic ganglion.

31. That the uterine ganglion sends a retina of organic nerves round the uterine arteries to their termination, and form glands, which regulate the contraction and dilatation of the uterus, as well as preside over the process of menstruation.

32. That the supra-œsophageal ganglion of the invertebrata is identical with the spheno-palatine ganglion.

33. That comparative anatomy clearly proves that all the arteries of the invertebrata are surrounded by a retina of organic nerves, which accompany them into the several organs and members of the body.

34. That the circulation of the blood to the arteries of the human subject is conducted under the presidency of the organic nerves, which surround them in the form of a retina, and extend along their entire course, sending twigs into their coats, until they form glands at the capillary termination of the arteries, through which the blood circulates. (See Harrison and Quain's Anatomy.)

35. That the capillary veins take their origin from these glands.

36. That the excretory ducts of these glands are the pores of the skin.

37. That the veins have no organic nerves surrounding them.

38. That the oxygen of the blood unites with these glands, and increases the temperature of the part, which is increased or diminished in proportion to the quantity of oxygen consumed.

39. That on the union of the oxygen of the blood with the organic glands, a certain quantity of electricty is generated.

40. That the electricity decomposes a certain portion of the serum

of the blood, allowing the hydrogen to unite with some of the salts of the blood and superfluous oxygen, that may not be required by the organic glands; the union of the oxygen and hydrogen forms water, which readily passes through the excretory ducts or pores of the skin, in the shape of steam; hence it is a man in profuse prespiration will be observed to give off steam very freely, provided he is kept at hard work, and supplied freely with water as often as he requires it.

41. That when a man takes violent exercise, the venous circulation is rapidly increased, and consequently requires to have the venous blood arterialized in proportion to the increased celerity of the circulation.

42. That the pulmonary glands evolve electricity with greater activity when the venous circulation is hurried.

43. The more oxygen thus passes into the blood than is required for the organic nervous ganglia or glands.

44. That the excess of oxygen overstimulates the organic glands, and that the temperature of the body is rapidly increased.

45. That if violent exercise is still persevered in, that the pulmonary nerves become exhausted, just as the torpedo will become exhausted, and fail to give off electricity.

46. That the moment the oxygen of the air fails to unite with the venous blood, that instant death is the result; hence a man is said to die of exhaustion, under such circumstances.

47. That animals, such as hares, which have been run to death, are found to have the blood in a fluid state, and deprived of its oxygen.

48. That the blood is indispensably necessary for the preservation of life, inasmuch as it is the current for conveying the oxygen to the organic ganglia and glands; it is, in truth, the stream of life; besides, it furnishes the materials for the regeneration and renovation of the health.

49. That life is held in existence in every part of the body by the union of the oxygen of the blood with the organic nervous glands and ganglia.

50. That when the union of the oxygen of the blood ceases all over the body, death of the whole body is the result.

51. That when the union of the oxygen of the blood with the organic nervous glands is interrupted by violence, or as, for instance, by the ligature of the femoral artery, in the lower extremity, then death of the lower extremity is the result.

52. That in old persons, who are subject to Pott's gangrene, the

mortification of the toes is the result of the failure of the oxygen to unite with the organic capillary nervous glands.

53. That persons exposed to great cold have their noses, ears, or fingers frost-bitten, followed by mortification, unless scientifically treated, in consequence of the oxygen not uniting with the organic nervous glands in the parts exposed to the cold.

54. That mental emotions, commonly referred to the heart, should be attributed to the cardiac ganglion.

55. That the sensation of hunger should be referred to the semilunar ganglia.

56. That a blow on the semilunar, the cardiac, the superior cervical, or the superior central ganglion, will cause death, by the shock being transmitted from the injured one to all the others, whereby the union of the oxygen with the ganglia is deranged and interrupted.

57. That if the blow is slight, the union of the oxygen with the ganglia and glands will be only momentary; signs of life will return, and the person will be said to have fainted.

58. That when a large quantity of blood is abstracted, syncope or fainting takes place; life is temporarily suspended, for the want of oxygen to unite with the organic nervous ganglia.

59. That when all the blood is removed, death takes place, for the want of oxygen to unite with the organic ganglia and organic glands.

60. That the abstraction of blood in the first stage of inflammation produces good effects, by diminishing the quantity of blood, and consequently withdrawing the stimulus of the oxygen from the organic nervous glands, which are in a state of irritation in the organ or part implicated.

61. That death by drowning, obnoxious gases, and all accidents which prevent the air entering the lungs, is caused by the want of oxygen to combine with the organic nervous ganglia and glands.

62. That chloroform destroys life by paralyzing the pulmonary organic nervous ganglia, whereby the glands are unable to evolve electricity in sufficient quantity to cause the union of the oxygen of the air with the venous blood in the gland.

63. That death, therefore, by chloroform is caused by the want of oxygen to combine with the organic ganglia and glands.

64. That the reason why Marshall Hall's Ready Method of establishing respiration fails, as well as the other means adopted for establishing artificial respiration, in cases where persons suddenly cease to respire, can be explained by knowing the pulmonary glands are para-

lyzed, and unable to discharge their functions of giving off electricity to unite the oxygen of the air with the venous blood.

65. That death caused by chloroform affords the strongest proof that the blood is not arterialized in the lungs by the process of endosmose and exosmose.

66. That it is manifest that if the blood in the lungs was arterialized by the process of endosmose and exosmose, that establishing artificial respiration should prove successful in restoring life.

67. To prove that the organic pulmonary organic ganglia are endowed with the property of giving off electricity, and to prove that the blood is not arterialized by the process of endosmose and exosmose, it may be necessary to refer to what happens in certain diseases.

Asthma.—When a person enters a meadow where the grass has been recently mown, he is liable to be attacked with difficult respiration, and all the symptoms of spasmodic asthma. The same state of things may be induced by going into an apothecary-shop where hippo are kept. Again, a third person will actually faint on inhaling the vapors of a sweet-scented rose. The vapors from the fresh hay, from the hippo, from the rose, all act in the same way. All pass into the lungs with the air, all come in contact with the pulmonary organic nervous gland, and interfere with or arrest its function of giving off electricity, to cause the union of the oxygen with the venous blood, in passing through the glands. In case of spasmodic asthma, the countenance of the patient will be purple, the lips and tip of the nose particularly so; showing the absence of oxygen in the blood. In the case of fainting by the vapors of the rose, the pulmonary organic nervous glands have their function of giving off electricity momentarily suspended; hence fainting or suspended animation, for the want of oxygen to combine with the organic nervous ganglia and glands, is the result.

When a child is attacked with whooping-cough, at certain intervals the child will be seized with fits of coughing; the air will be continually expelled by forced expiration, until all is apparently forced out of the lungs. At the time, if the child's countenance is examined, it will be observed to be pale and livid. The patient now struggles for breath, and each inspiration is accompanied by a peculiar kink, until respiration is again established. Here the pulmonary organic ganglia are in a state of spasm; they become incapacitated to discharge their function of giving off electricity to combine the oxygen with the ve-

nous blood; hence the pallid, livid countenance can be accounted for. The patient is on the verge of fainting for the want of oxygen to combine with the organic nervous glands and ganglia.

Another proof that the blood is not oxygenized in the lungs by the process of endosmose and exosmose is furnished by the appearance and symptoms of a person laboring under great enlargement of the heart, with a valvular disease. In a case of this kind, there is no obstruction to the air passing into the lungs by the windpipe; and consequently, if the blood was arterialized by the soaking in of the oxygen from the air, there could be no difficulty about the arterialization of the blood. But the congestion of the countenance—the lividity of the lips and nose—the distressing and suffocative respiration—the inability to remain in a recumbent position—the relief obtained by pressure of the chest against a chair or table—the laborious and confused action of the heart—the undulating and intermitting pulse—the cold extremities—all indicate great derangement of the organic nervous system. It is evident the blood is not sufficiently oxygenized. It is evident, therefore, the organic pulmonary glands are incapacitated from doing their duty. It is manifest the action of the heart is deranged. Here the difficulty is caused by pressure of the enlarged heart on the cardiac ganglion. When its anatomical relations are recollected, it will be at once perceived that the ganglion could not possibly escape pressure; and that the more it is pressed on, the more difficult the respiration becomes, until eventually respiration ceases altogether, in consequence of the pulmonary organic ganglia being rendered powerless, by the continued pressure the cardiac or pulmonary ganglion is subjected to.

There is one remarkable symptom which annoys a patient very much—namely, the apprehension of dying suddenly, or when asleep. Here the cardiac ganglion communicates truly the trouble it labors under to the superior central ganglion, by the par vagum. The superior central ganglion is in communication with the brain; hence the patient is made cognizant of the danger which threatens his very existence.

It will be shown in another place, that when the superior central suffers compression, that it communicates its trouble to the cardiac ganglion.

(The study of the connection between the cardiac and superior central ganglion merits the earnest attention of the student.)

68. That intermittent, even bilious remittent fever, yellow fever,

typhus fever, small-pox, measles, scarlatina, puerperal fever, are communicated by the atmosphere to communities.

69. That the immaterial poisons of malarious and zymotic fevers are communicated to individuals by the entrance of the poisons with the oxygen of the air, in which they are suspended, into the blood, and their subsequent impression on, and communication to, the organic glands, on the union of the oxygen of the blood with the organic nervous glands.

70. That, for instance, when a person who has not been vaccinated remains in a badly-ventilated room for some time where a patient is laboring under small-pox, that the poison will enter the blood, and poison the organic glands, in the manner described.

71. That after some days, the organic nervous glands will give unmistakable evidence of suffering from the poison, by a severe rigor; thus showing that the organic glands are rendered almost unable to unite with the oxygen of the blood, as well as that the pulmonary organic glands are unable to evolve the electricity required to procure a sufficient quantity of the oxygen of the air to unite with the venous blood.

72. That after some time reaction takes place, and the organic nervous glands become excited; an increased quantity of oxygen gets into the blood; consequently, the heat of the surface is increased.

73. That the capillary arteries, after the third day, become dilated, and carry more blood to the organic nervous glands than usual. The temperature of the surface, as just stated, is increased by the union of the oxygen of the blood with the organic nervous glands; a greater quantity of electricity is generated, on account of a greater amount of oxygen being consumed.

74. That the organic glands now commence to eliminate the poison that they are charged with; and on their union with the oxygen, the poison, with the superfluous oxygen, is given off at the same moment that the electricity decomposes the serum of the blood, the hydrogen of which unites with the oxygen containing the poison, and forms lymph, which accumulates under the cuticle, in due time forming a pimple; and as the case goes on, a vesicle is formed, and ultimately a pustule.

75. That when the matter of small-pox is inserted in a small wound on the surface of the body, that the same derangement of the organic nervous system is observed to follow, as well as the same appearance of purple vesicles and pustules on the cutaneous surface.

76. That when a woman pregnant is seized with small-pox, in the event of her delivery, the child will be covered with pustules. Here the oxygen of the blood of the mother is uniting with the organic nervous glands at the termination of the maternal uterine arteries, poisoning the organic nervous glands formed at the termination of the hypogastric arteries of the fœtus, with which they inosculate, and become incorporated in the placental lobule. Thus the fœtus is inoculated precisely in the same way as if a wound was made on any part of its body, and the poison inserted into it.

77. That the mode in which small-pox is communicated to the fœtus in utero affords one of the strongest proofs of the nervous connection between mother and fœtus; it also explains the way syphilis is communicated from the mother to the fœtus in utero.

78. That a paroxysm of intermittent fever affords clear evidence of the mode of operation of the oxygen, in its connection with the organic nervous glands and ganglia.

79. That a patient in the first stage of intermittent fever will be found deadly cold, his countenance pale and contracted; in a word, all his vital powers prostrated. Here the pulmonary glands fail to give off a sufficient quantity of electricity to cause a requisite quantity of the oxygen of the air to unite with the venous blood; hence there is not a sufficiency of oxygen in the blood to unite with the organic glands at the termination of the arteries; hence it is the temperature of the surface falls, the provision for heating the surface being interrupted or suspended. Here, too, the patient may die during the paroxysm, for the want of oxygen to combine with the organic nervous glands or ganglia.

80. That in the second stage of intermittent fever, the organic nervous glands and ganglia become resuscitated; by degrees the pulmonary organic ganglia give off more electricity; more oxygen passes into the blood; there is more oxygen to unite with the organic ganglia and glands; the skin after some time becomes burning hot, the countenance becomes flushed, and there is great vascular excitement; the patient will complain of thirst. Here it is the spheno-palatine ganglion announces there is an excess of oxygen in the blood, and that water is required, or rather the hydrogen of the water, to carry it off.

81. That a person during the third stage will be found in a profuse perspiration; as soon as there is an excess of oxygen in the blood, great heat is evolved, and consequently a large amount of electricity. The electricity decomposes the serum of the blood, the hydrogen of

which combines with the superfluous oxygen, and forms vapor, which passes through the pores of the skin; if the patient is well supplied with cold water, he will soon be in a copious perspiration, as the water will quickly get into the circulation, and its hydrogen made to combine rapidly with the excess of oxygen in the blood, by the action of the electricity.

82. That as soon as the excess of oxygen with the malarious poison is carried off by the perspiration, the patient will be relieved of all his distressing symptoms, and express himself by exclaiming that he is well.

83. That as a further proof of the manner in which water quenches thirst by the hydrogen uniting with the excess of oxygen in the blood, that immersion in salt water will allay thirst; here the water passes in through the pores of the skin; the electricity evolved decomposes the water, the hydrogen of which unites with the excess of oxygen, and forms water, which is carried into the venous circulation; hence it is that a man hauled after a raft will prolong life comfortably, whilst another on a raft will die of fever induced by the irritation of the organic nervous ganglia, after suffering the most excruciating agony.

84. That an immaterial agent resembling electricity, and called life, is held in existence by the union of the oxygen of the blood and the organic nervous glands and ganglia.

85. That immaterial agents have the power of acting through material agents, as is exemplified by a current of electricity passing thousands of miles through a wire, or by the immaterial agent known as volition passing through a nerve, from the brain to the toes, or by a loadstone rendering a bar of steel magnetic by simple contact, precisely as vitality is communicated from the organic nervous system by a shock, which gives a thrill, that pervades the whole human body, to the semen, at the instant of its propulsion, through the virile organ.

86. That the organic nervous system can act independently of the animal nervous system, as is exemplified when the aretenoid muscle closes the glottis, when brought in contact with sulphureted hydrogen or carbonic gas; the action of the heart, the circulation of blood through the arteries, the secretion of the gastric juice, the bile, urine, the salivary secretion, the secretion of semen, the peristaltic action of the intestines, and cutaneous perspiration.

87. That the animal nervous system can act independently of the organic nervous system, as is exemplified in the act of exercising reason, volition, memory, and locomotion.

88. That the animal and organic nervous systems can act in concert, as is well exemplified in the case of singing. Here the mind, located in the brain, wills that the larynx shall sound a certain note, and sends a message to it by an *animal* nerve—the recurrent branch of the *par vagum*. The brain communicates with the central superior ganglion. The larynx is furnished with muscles, whose duty it is to render the *vocal cords* either tense or otherwise, to bring out the note required by the *mind*. These *muscles* are supplied with nerves from the superior *cervical* organic ganglion; and as the muscles obey the dictates of the mind, it follows, as a consequence, that the *organs* from whence the *organic nerves* are derived must be conscious of what is going on in the mind located in the brain; *otherwise*, how could the muscles be regulated with such *precision?* The *note* is the product of the combined wisdom of *both* nervous systems, and may be said to be a *procession* from both.

Some persons may regard this explanation as absurd; but I have stated facts which demand deep reflection, thought, and penetration, and, to a certain extent, demonstrate the truth of one of the greatest mysteries in the Christian religion—namely, the Trinity.

89. That what occurs to some persons on being told disastrous intelligence, strongly indicates the connection between the animal and organic nervous systems. Here, the mental excitement located in the brain communicates with the superior central ganglion; the latter communicates the intelligence by reflex action through the brain to the par vagum, an animal nerve, which latter conveys the intelligence to the cardiac organic ganglion, with which it communicates; hence the anguish, pain, and palpitation about the region of the heart, also to the lungs; hence the hurried respiration; the pulmonary nerves are temporarily rendered powerless to give off the electricity; hence the anxiety for air; the par vagum inosculates with the organic nerves of the stomach, and if at dinner, loss of appetite is the result, the gastric juice being no longer secreted. The par vagum also communicates with the hepatic organic nerves, the secretion of bile is the result; also with the renal organic nerves, the secretion of urine is the result. In case of a woman pregnant, through the uterine nerves to the uterus, causing contraction of the uterus and abortion; or, if it happens in the last months of pregnancy, a dead child, or one on being born will be attacked with convulsions, or one after some time who will give evidence of idiocy.

90. The connection between the animal and organic nervous sys-

tems is well exemplified when a person longs for food, when a copious secretion of saliva takes place.

Here, the brain, the animal nervous ganglion, communes with the superior central ganglion; the latter communes through the brain and superior maxillary nerve (the second division of the fifth) with the spheno-palatine ganglion; the spheno-palatine ganglion communicates with the submaxillary gland through the chorda tympani nerve, which is distributed to the gland; the capillary arteries become dilated through the organic nervous retina; more oxygen, and thus more blood is admitted, more heat and electricity evolved. The electricity decomposes the serum of the blood, the hydrogen of the latter unites with the excess of oxygen, and some of the salts of the blood secreted from the blood in the gland forms saliva, which passes off by the excretory duct of the gland.

91. The following passage from the Old Testament bears closely on the subject under discussion, showing how Jacob caused the cattle to be marked by different colors; shows the connection between the animal and organic nervous systems:

"And it came to pass, whensoever the stronger cattle did conceive, that Jacob laid the rods before the eyes of the cattle in the gutters, that they might conceive among the rods."—Genesis, 30: 41.

92. A good illustration of the connection between the animal and organic nervous systems is afforded by watching the appearance of a bashful person when charged with some ludicrous act.

The brain communicates with the central cerebral organic ganglion, and the latter by reflex action communicates with the brain and facial nerve, and the latter with the organic nerves surrounding the transverse facial artery, (it will be recollected branches of the facial nerve accompany this artery;) the result is, that the capillary arteries at once become dilated and are injected with arterial blood, giving a crimson color to the face; at the same time, that the temperature of the cheek is increased in consequence of the large quantity of oxygen supplied to the nervous organic glands. Here the organic nerves surrounding the arteries are stimulated.

93. The connection between the animal and organic nervous systems is made manifest when a person is afflicted with grief. Here the brain, the chief ganglion of the animal nervous system, communes with the superior central ganglion, the chief ganglion of the organic nervous system. The latter communes by the brain and lachrymal branch of the ophthalmic division of the fifth nerve (animal) with the organic nerves

surrounding the capillaryarteries, and entering into the formation of the organic nervous glands, where the capillary arteries terminate and the capillary veins commence, and the excretory duct to carry off the tears, take their origin in the lachrymal gland. When the distribution of the nerve is recollected, as well as that it inosculates with the organic nerves of the parts to which the branches are distributed, there cannot be much trouble in accounting for the suffused condition or redness of the eyes, the capillary arteries being dilated so as to admit blood where none was visible previously. The mode in which the tears are secreted by the organic glands can be explained by recollecting the capillary artery is dilated, carries more blood, more oxygen, and consequently, that on the union of the oxygen with the gland, more heat is the result, as well as a greater amount of electricity; that the electricity decomposes the serum of the blood in its passage through the gland, which unites with the oxygen, as well as some of the salts of blood secreted by the gland, which form tears, which pass off by the excretory duct of the gland.

94. That why a person who is told dreadful intelligence will get deadly pale, is accounted for by recollecting that the brain communicates with the central superior ganglion, and the latter by reflex action through the brain and facial nerve with the organic nerves surrounding the transverse facial arteries, rendering the nerves powerless, causing contraction of the capillaries; hence, the circulation becomes feeble and the countenance pallid. If the shock is very terrific, fainting may ensue, the pulmonary nerves being unable to perform their functions; the requisite quantity of oxygen to unite with the organic glands and ganglia does not pass into the blood; hence, animation becomes temporarily suspended. Here the organic nerves are depressed.

95. That it therefore follows, that excitation of the organic nerves surrounding an artery will cause its dilatation, permit more arterial blood to enter it, and consequently a large quantity of oxygen to unite with the organic nervous gland, giving rise to increased heat. It also follows, that whatever depresses the organic nerves surrounding the artery, causes contraction of the capillary arteries, and consequently, lowers the temperature of the part, inasmuch as there is no oxygen to combine with the organic nervous glands.

96. That "*rubor et tumor cum calore et dolore*," which are characteristic of inflammation, can be understood.

97. That the heat, pain, redness, and swelling of a phlegmon are susceptible of explanation.

The redness is caused by the capillaries becoming dilated and allowing more oxygen, and consequently, more blood to enter them; the increased heat, by the greater consumption of oxygen by the organic glands; the pain, by the irritation of the nerve surrounding the capillary arteries; the swelling, by the increased size of the capillaries.

If a phlegmon be opened at this period, a large quantity of arterial or red blood will be discharged, the color of the venous blood being changed by the action of the electricity given off during the union of the oxygen with the organic nervous glands.

98. That the application of the syphilitic poison to the organic nerves surrounding the capillary arteries, and forming the organic glands on the prepuce or glans penis, produces no effects for some time.

99. That as soon as the poison commences to act, itching of the part will attract attention, accompanied with redness. After some time, the itching will give way to heat and pain; the redness will assume a deeper color, and elevation or swelling of the part will be observable. Here, it will be perceived, the itching is attributable to the excited condition of the organic nerves surrounding the arteries; the redness to the dilated condition of the arteries, which admit more arterial blood than usual; the heat to the increased quantity of oxygen which is brought by the dilated arteries to combine with the organic glands; the subsequent pain to the irritation of the nerves; the swelling to effusion of lymph. A greater quantity of oxygen than usual, as just stated, increases the temperature on the union of the oxygen with the organic glands; electricity is evolved, which decomposes some of the serum of the blood; the hydrogen of the serum unites with the excess of oxygen, which, in union with some of the salts of the blood, forms lymph.

100. The connection between the animal and organic nervous systems is made apparent when a person looks behind his shoulder at an object. It will be recollected that the superior cervical ganglion sends branches to the cervical spinal nerves, to the sixth or abducens, as well as to the lenticular ganglion. Here the relaxation or contraction of the abducens muscles, supplied by the sixth nerve, is regulated by the branch from the superior cervical ganglion; the proper axis of the pupil is regulated by the lenticular ganglion through the branch sent from the superior cervical ganglion; whilst the muscles of the neck supplied with spinal nerves are made to act in accordance with the wishes of the mind by means of the branches of the superior cervical ganglion.

101. A familiar example of the connection between the animal and organic nervous systems is presented in what is commonly called the milk draught. As soon as the mother sees her child after a short absence, her breasts will instantly become filled with milk. Here, the explanation consists in recollecting that the brain communicates with the central cerebral organic ganglion; the latter by reflex action through the brain, spinal cord, and by the thoracic branches of the brachial plexus with the organic nerves surrounding the mammary arte ries, causing dilatation of the arteries, the entrance of a larger quantity of arterial blood; next the elimination of the constituents of the milk, combined with oxygen by the gland, and their subsequent union with the hydrogen of the serum of the blood by the action of the electricity; thus forming milk, which is carried off by the milk-ducts.

102. Mental emotions of an amatory character demonstrate the connection between the animal and organic nervous systems.

The excitement, being of a pleasurable description, is communicated from the cerebrum, the great animal nervous ganglion, to the superior central ganglion, the great chief of the organic ganglionic system; the latter communes through the brain and facial nerves with the capillary retina of nerves surrounding the coronary arteries of the lip; the result is, the arteries become dilated and contain more blood; hence the pouting of the lips that ensues.

Again, further communication is had through the thoracic branches of the brachial plexus with the mammary arteries distributed to the nipple; the arteries become dilated and injected with blood; hence the erection of the nipples is the consequence.

Again, through the pudic nerve with the organic branches of nerves surrounding the pudic artery, and distributed to the clitoris; hence dilatation, injection, and erection of the clitoris. In the male subject, erection of the penis.

It is to be remembered that when the animal and organic nervous systems are acting together, that excitement will cause dilatation of the capillary arteries through communication of the organic nerves surrounding them with branches of the animal nerves, in the same way that depression will be communicated to the organic nerves surrounding the capillary arteries by the communication of the branches of the animal nerves, with which they inosculate.

103. The connection between the animal and organic nervous systems is illustrated on looking at what occurs when a surgeon is about reducing a recent dislocation of the shoulder-joint. As soon as the

surgeon places his index and middle fingers of one hand under the head of the humerus, (if the dislocation is in the axilla,) and grasps the elbow of the patient with the other, he directs the attention of the patient to some extraordinary subject, and at the same moment, by well-directed action of both hands, reduces the dislocation. Thus, by throwing the patient off his guard, he has no difficulty in reducing the dislocated bone. In the event, however, of his not being able to distract the patient's attention, this easy method may fail, inasmuch as, so long as the patient keeps his eye upon the affected shoulder, the animal and organic nerves will act in concert, and by strong contraction of the muscles baffle the efforts of the surgeon.

104. That vivisections demonstrate that all the vital functions can be carried on by the organic nerves independently of the action of the cerebro-spinal system of nerves.

105. That vivisections demonstrate that the brain may be totally destroyed without destroying life.

106. That vivisections demonstrate that the head may be severed from the trunk without destroying life either in the head or body.

107. That vivisections demonstrate that a crab or lobster, or an eel, may be cut in several pieces, and each part be still possessed of life.

108. That vivisections demonstrate that the snail may have his head cut off, and yet survive.

109. That vivisections demonstrate that the common earth-worm may be divided in two, and each half form a distinct animal.

110. That these vivisections demonstrate that the cerebro-spinal system is not essentially necessary to life.

111. That vivisections demonstrate that the cerebro-spinal nervous system is made the medium of communication between the organic nervous ganglia located at distant parts; as is exemplified in case of the eye, where the lenticular ganglion acts under the guidance of the central cerebral ganglion through its connection with the third nerve and brain, or the central cerebral ganglion with the cardiac ganglion through its connection by means of the brain and par vagum.

112. That vivisections demonstrate that stertorous breathing and slow pulse can be produced by pressure on the central cerebral ganglion.

113. That vivisections demonstrate that any part of the brain may be cut away without destroying life; that any part may be pressed upon without producing stertorous respiration or slow pulse, with the exception of that placed over the central cerebral ganglion.

114. That the reason why stertorous respiration, slow, laborious pulse, with dilated pupils, are not present in a patient laboring for years under chronic hydrocephalus, is, that the central ganglion is not pressed on, but floats in the serum.

115. That when the central cerebral ganglion is pressed on, the union of the oxygen with its tissue is interfered with; that the disturbance to which it is thus subjected is rendered apparent by the dilated pupil, as it is no longer able to communicate with the lenticular ganglion, through its communication with it by means of the communicating branch of the third nerve. That the heart suffers from the oppression of the central superior ganglion, is rendered manifest by its oppressed and laborious action; the oppression the ganglion labors under is communicated by the par vagum to the cardiac ganglia, from whence the heart is supplied with organic nerves. The stertorous respiration leaves no doubt as to the suffering of the pulmonary organic glands from the oppression of the central cerebral ganglion. The pulmonary nerves are derived from the pulmonary ganglion, and are connected by the par vagum to the central superior ganglion. Death is caused by the pulmonary organic glands being unable, in consequence of the continued oppression, to give off electricity to cause a sufficient quantity of oxygen to unite with the venous blood: hence the patient will die by degrees; the quantity of oxygen becoming momentarily less, until there is not enough present to preserve life. The patient dies for want of oxygen.

116. That vivisections demonstrate that the cerebro-spinal nervous system has no power over the organic nervous system, or cannot control its operations.

117. That the organic nervous system is all connected together by links of communication; and that whatever affects one, affects all the others.

118. That comparative anatomy demonstrates that reason, judgment, and volition are located in the brain, the principal organ of the animal nervous system.

119. That Camper's experiments demonstrate that, in proportion to the size of the cerebrum, the faculties specified in the last paragraph are developed; inasmuch as he found the facial angle in the orang outang to be sixty-six; in the lowest tribe of the Hottentots seventy, and the highest European (Italian) seventy-six.

120. That the post-mortem examinations of the heads of congenital idiots demonstrate thick skulls, imperfectly developed; the lobes of the

cerebrum being small and imperfectly developed, and in some instances, in the place of the cerebrum, a cyst of serum.

121. That the attachments of the olfactory, the optic, the auditory, and the gestatory nerves demonstrate that the brain has certain regions of it allocated for specific purposes.

122. That as locomotion is conducted under the influence of the will, located in the brain, it is therefore necessary there should be messengers to all parts of the body from the brain; and accordingly, the spinal cord, with the nerves proceeding from it, serve all the purposes required, with regard to the action of the muscles all over the trunk and extremities, as well as by their sensitive power give warning to the mind of external objects which should be avoided.

123. That notwithstanding man has the power over his will, and may lead whatever life he thinks proper, yet he has no power over his life; in other words, he has not the power by any act of his own will to destroy his life; he cannot command his respiration to cease, or his heart not to pulsate; he must apply for an external agent.

Action of Medicines on Organic Nervous System, as well as Action of Poisons.

124. That when belladonna is applied round the eyelids, the pupil is dilated. The iris is supplied with organic nerves exclusively; hence it is clear the belladonna acts on the organic nerves of the capillary arteries, and the glands in which these nerves terminate. Belladonna applied over the stomach, or round the nipple, or applied to the os uteri, or introduced into the rectum, will produce dilatation of the pupil, by acting on the the organic nerves of these parts. Belladonna, when taken internally, acts on the organic nerves of the stomach; hence dilatation of the iris is the result. It is evident, from what has been just stated, that belladonna acts on the organic nerves, and that it does not act by absorption.

125. That when opium is taken into the stomach, contraction of the pupil takes place; when opium is applied to a part denuded of the cuticle by a blister, contraction of the pupil is the result; when opium is introduced into the rectum, contraction of the pupil is the result; the iris is supplied exclusively by organic nerves; the stomach is supplied with organic nerves; the organic nervous glands of the skin are exposed to the action of the opium, on the removal of the cuticle. In each of these cases, the opium acts on the organic nerves.

126. That when strychnine is taken into the stomach, tetanic spasm

of the muscles is the result; when the cuticle is removed by the application of a blister, and strychnine applied to the abraded surface, tetanic spasm is the result; when strychnine is introduced into the rectum, tetanic spasm is the result. In the one case the organic nerves of the stomach are affected, in the other the organic nervous glands of the skin.

127. That when croton oil is placed on the tongue, or taken into the stomach, or rubbed on the skin over the abdomen, or introduced into the rectum, it acts as a purgative. In the first case, it acts on the organic nervous glands of the tongue; in the second, on the organic nervous glands of the intestines; and in the third, on the organic nervous glands of the skin. Croton oil acts as a stimulant on the organic nervous glands of the intestines. The croton oil stimulates the retina of organic nerves surrounding the capillary arteries; thus dilates the capillary arteries, thus allowing more blood as well as oxygen to pass to the organic glands, which secrete the serum from the blood, in the manner already described.

128. That when tobacco is taken into the stomach, it induces intense nausea, as well as great prostration and relaxation of the muscular system. When given as an enema, it produces the same effects. When applied to the head, it produces similar effects. In the one case it produces its nauseating effects by its action on the organic nervous glands of the stomach; in the second, on the organic nervous glands of the rectum; in the third, its action is on the organic nervous glands of the scalp.

129. That when arsenic is taken into the stomach, it produces intense burning, extreme thirst, contraction in the throat, with vomiting and purging. When arsenic is applied to remove a cancer, or as a local application in cutaneous diseases, it produces a similar train of symptoms as when taken into the stomach or introduced into the rectum. In the one case, it acts on the organic nervous glands of the stomach: in the other, on the organic nervous glands of the lip; in the third, on the organic nervous glands of the skin. In all cases where arsenic is applied, the specific action of the arsenic is made manifest by its specific action on the nerves of the stomach.

130. That when cantharides is taken into the stomach, the organic nervous glands of the kidneys are acted on. When a blister is applied to the surface, the organic nervous glands of the skin are irritated, and the specific action of the cantharides made manifest by the action on the organic nervous glands of the kidneys.

131. That when spirits of turpentine is taken in the stomach in a small dose, it acts on the organic nervous glands of the kidneys; when applied to the skin, it acts on the organic nervous glands of the skin. In both cases, the action is on the organic nervous glands of the kidneys. When turpentine is inhaled into the lungs, it acts on the organic nerves of the kidneys.

131½. That when mercury is taken internally for some time, secretion from the salivary glands, with a spongy state of the gums, is the result; when mercurial ointment is applied to the inside of the thigh for some time, a similar state of things is the result; when a person inhales the vapors of mercury for some time, similar phenomena are observable. In all cases the mercury acts on the organic nerves. In all cases the specific action of the mercury is directed to the organic nervous glands supplying the salivary glands, as well as those supplying the gums and tongue. The specific action of the mercury is therefore always made first manifest on the organic nervous glands just specified.

132. That when tartar-emetic is taken into the stomach, it produces nausea and vomiting, by its action on the organic nerves of the stomach; when injected into a vein, it produces vomiting; when introduced into the rectum, it produces vomiting. In all cases it acts on the organic nerves of the stomach.

133. That when tartar-emetic ointment is rubbed on the chest, it acts as an irritant on the organic nervous glands of the skin, irritating the organic nerves of the capillary arteries, causing dilatation of the arteries, allowing more blood to enter the capillaries, as well as more oxygen; consequently increasing the temperature, with the evolition of a greater amount of electricity, the consequent effusion of lymph, serum, and pus, as already described. Hence it is, when tartar-emetic is applied to the organic nervous glands, it acts as an irritant. The connection between the organic nerves of the thorax and scrotum is made manifest by recollecting, although the ointment is only applied to the chest, pustules will appear on the scrotum.

Effects of Animal Poisons.

134. That animal poisons act on the organic nerves of the part inoculated, as is observed in the case of chancre. The poison of syphilis will produce an ulcer on the part only where the poison is applied; whereas, if the poison acted by absorption, it would produce similar ulcers all over the body.

135. That a person who has been bitten by a mad-dog will have

the wounds healed, and will not have his attention directed to the wound until symptoms of hydrophobia are about setting in, when the original wound will be found inflamed; showing that the poison has remained dormant perhaps for weeks or months, and located solely in the organic nerves of the part wounded.

136. That as long as hardness corresponding to the site of a Hunterian chancre remains, secondary symptoms may be expected, inasmuch as the organic nerves of the part are still contaminated by the poison.

137. That when a person making a post-mortem examination of a person who has recently died of puerperal fever, gets a very slight wound, scarcely large enough to command his attention, that the first notice he will have of being poisoned will be an attack of a rigor; showing the implication of the whole organic nervous system in the trouble.

138. That on examination of the wounded part, about this period a vesicle will present itself, showing that the organic nerves of the part have been poisoned, and that irritation of the organic nerves has taken place.

139. That excision of the hardness corresponding to the site of a chancre, excision of the part bitten by a rabid animal, as well as the wound inflicted by the knife of the anatomist, should be always the rule of surgical practice.

Venesection—Cupping—Leeches.

140. That venesection is only proper in the first stage of inflammation, when there is an excess of oxygen in the blood.

141. That as soon as lymph, serum, or pus is formed, the excess of oxygen in the blood is diminished, and consequently the demand for venesection ceases to be imperative.

142. That in case of pneumonia, where one of the lungs becomes hepatized, that the withdrawal of blood, and consequently oxygen, would place the patient's life in the greatest jeopardy, inasmuch as the whole duty of providing oxygen for the blood, and consequently for the organic nervous ganglia and glands, would devolve upon the sound lung, which, under such circumstances, might fail in its efforts to do so; thus resulting in the speedy dissolution of the patient, for the want of oxygen to combine with the organic nervous ganglia and glands.

143. That venesection is not proper when a person has received a great shock by violence, as a fall from a height, inasmuch as life is

nearly extinguished. The pulmonary glands are barely able to evolve as much electricity as will enable enough of oxygen to enter the blood to hold life in the organic ganglia and glands.

144. That this is evident from the fact that the surface quickly gets cold, the pulse almost imperceptible, the countenance pale and ghastly, the respiration feeble. The whole organic nervous system is suffering from the want of oxygen and the withdrawal of blood, and consequently oxygen, under such circumstances, would be placing the life of the patient in the greatest peril, inasmuch as it would be taking away the stimulus on which life depended for existence.

145. That the administration of stimulants, such as brandy, ammonia, opium, in small doses, is the proper treatment, when a person is in a state of collapse, as just described. The stimulants act on the organic nerves of the stomach; the stimulating effect is communicated by the par vagum to the cardiac ganglion; resulting in stronger action of the heart, as well as more vigorous respiration; more oxygen getting into the blood, announced by warmth of the surface; more oxygen is sent to the central superior ganglion, announced by returning animation of the countenance. Reaction is thus established.

146. That the local application of leeches, as well as the abstraction of blood by cupping, relieves or prevents inflammation, by withdrawing the oxygen from the organic nervous ganglia and glands.

147. That the question of blood-letting and the administration of stimulants is one about which there is a very great difference of opinion. In the beginning of the present century, the lancet was invariably and immediately had recourse to on the invasion of any organ by inflammation; the medical men, although untutored in the science of percussion and auscultation, were admirably instructed with respect to the indications afforded by the pulse. As long, therefore, as hardness or firmness of the pulse indicated depletion, they undauntedly persevered in the abstraction of blood, and constantly had their heroism crowned with success, by the convalescence of the patient. It will be recollected that the abstraction of blood, by diminishing the oxygen in the blood, acts as a sedative on the organic glands and ganglia; and that, by keeping up the sedative action, no mischief could take place, no dilatation of the capillary arteries by the excitation of the organic nerves surrounding them; and consequently, no extra heat, no effusion of lymph, serum, or pus; and consequently, no destruction of the organ attacked could result. At the present time, it is fashionable to give stimulants from the onset of an attack of inflammation. If the stim-

ulants are given immediately, they most unquestionably add fuel to the fire; they cause more oxygen to pass into the blood; they excite the capillary nerves, causing dilatation of the arteries, the admission of more arterial blood, with an increase of temperature, and the speedy effusion of lymph or serum; on the occurrence of which, depression as well as a shock follows, the organic pulmonary nervous glands fail to give off electricity to unite the oxygen with the venous blood, and the patient dies very often for the want of oxygen.

148. Stimulants are useful in some cases; where, for instance, the organic nervous glands are succeeding, by a new action, in throwing off the excitement, by the effusion of lymph, serum, or pus. Here the stimulants excite the pulmonary organic glands, causing them to give off electricity to combine the oxygen with the venous blood; thus preserving life, whilst the organ affected is undergoing the proper treatment for its restoration to a healthy state.

149. That the indiscriminate exhibition of stimulants, as recommended by the late Mr. Todd, is certainly not called for. Mr. Todd should have qualified his directions, and pointed out the cases where it would be advisable to give them.

150. Every medical practitioner knows that persons laboring under typhoid fever, typhus mitior or gravior, small-pox, measles, scarlatina, or erysipelas, will get well without getting any stimulants; but it does not therefore follow that stimulants are not sometimes required; as, for instance, when the disease under which the patient labors puts on a typhoid character, as indicated by the appearance of the tongue, the action of the heart and pulse at the wrist. Let me remark, it requires judgment to decide when stimulants should be given or when withheld.

151. With respect to blood-letting, it never should be employed in typhoid, typhus mitior or gravior, small-pox, measles, scarlatina, or erysipelas, inasmuch as these diseases are the result of a specific poison impressed on the organic nervous glands, on the union of the oxygen with them; and further, that the organic nervous glands require a certain number of days to throw off the poison, and that they very often require assistance, in the shape of stimulants or nutriment, to enable them to do so. Hence depletion at the commencement would be jeopardizing the life of the patient at the termination of the disease.

152. That the mode in which immersion in cold water, instantly put in practice after a person is scalded, prevents vesication, is by the sedative action of the cold on the capillary organic nerves and glands, thus preventing the dilatation of the capillary arteries; consequently, the entrance of a greater quantity of blood, as well as oxygen, than usual; thus arresting animal heat, and the evolution of electricity, on which latter the effusion of serum from the glands depends.

153. That the mode of operation of a blister, when applied to the surface of any part of the body, can be explained by recollecting the flies stimulate the organic nerves surrounding the capillary arteries, causing dilatation of the capillary arteries; thus causing an increased quantity of blood with oxygen to enter the capillary arteries, a higher temperature, caused by the greater quantity of oxygen brought to unite with the organic nervous glands; consequently, a greater evolution of electricity on the union of the oxygen with the glands. The decomposition of the serum of the blood by the electricity—the union of the hydrogen with the excess of oxygen—the formation of serum, which escapes through the pores of the skin or excretory ducts of the glands—its deposition under the cuticle—the pores of the latter being closed by gelatinous matter, consequent on the increased temperature of the part.

154. That cold acts as a sedative on the organic nervous system is beyond a doubt, whilst heat acts as a stimulant to the organic nervous system.

155. That certain medicines act as sedatives on the organic nervous system, whilst others act as stimulants.

156. That veratrum viride and tartar-emetic, in small doses, act as sedatives to the organic nervous system; whilst brandy, ammonia, and opium, in small doses, act as stimulants to the organic nervous system.

157. That veratrum viride and tartar-emetic will subdue all the symptoms characterizing inflammation; whilst brandy, ammonia, and opium will remove the symptoms characteristic of collapse, the converse of inflammation.

158. That transfusion, in case of violent flooding after parturition, should be practiced, inasmuch as it conveys blood into the venous circulation, to be subsequently oxygenized, and conveyed to the organic nervous glands and ganglia.

159. That the tossing about of the patient, the anxiety for air, the clammy, cold surface, the feeble pulse, the tendency to faint, indicate

the want of oxygen to combine with the organic nervous glands and ganglia, in a case where transfusion is necessary.

Causes of Death for Want of Blood to carry the Oxygen to the Organic Nervous Glands and Ganglia.

160. That when a person is suffering from hectic fever concomitant on a diseased joint, when there are profuse night-sweats, alternating with diarrhœa, together with a profuse discharge from the diseased joint, as is exemplified in scrofulous disease of the knee or hip joint, the quantity of blood gradually diminishes, until there is not enough left to convey a sufficient quantity of oxygen to the organic nervous ganglia or glands; the patient, therefore, dies from want of oxygen.

161. That when a person is attacked with Asiatic cholera, after a few copious serous discharges from the bowels, he will be found with a collapsed countenance, without a pulse at the wrist, with the surface of the body deadly cold, with suppression of urine. (The serum of blood being removed, no provision is made for urine.)

162. That the phenomena in case of cholera are thus explained: The serum of the blood is all drained off; consequently, there is scarcely any blood left to convey the oxygen from the lungs to the organic nervous glands or ganglia: hence the feeble action of the heart and arteries; hence the haggard countenance; hence the suppression of urine; hence the cold surface. There is no oxygen brought to unite with the organic nervous glands; consequently, there is no heat. The patient dies for want of oxygen to combine with the organic nervous glands and ganglia.

Death by Mortification.

163. That when a man gets a compound fracture of the leg, followed by mortification, the union of the oxygen with the organic nervous glands ceases in the extremity thus affected; that the death of the extremity is communicated to the pulmonary organic nervous glands by the venous blood, contaminated by its connection with the dead part; the venous blood thus poisons the pulmonary organic glands, interfering with their property of giving off electricity to unite the oxygen of the air with the venous blood; the organic ganglia and glands thus suffer from the want of oxygen, announced to the observer by the Hippocratic countenance, the yellowish tinge of the skin, the cold surface, the absent or intermittent pulse, the feeble respiration, the hiccup, the sudden dissolution of the patient. The pulmonary organic glands

eventually are unable to give off any electricity, and the patient dies from the want of oxygen, as before stated.

Death by Phthisis—Pneumo-Thorax.

164. In the last stage of phthisis, when the patient is reduced to a skeleton by the combined operation of night-sweats, diarrhœa, and expectoration of purulent matter, he will be suddenly subjected to a severe shock, caused by the entrance of air through an ulcerated opening into the pleura, causing collapse of the lung, and filling the place occupied by the lung with air. Under such circumstances, there is only one lung to furnish the oxygen, the quantity of blood being reduced by the contingencies above specified. There is barely enough of blood to convey as much oxygen as will hold life in existence. As the quantity of blood continues to diminish, the oxygen continues to diminish, until at length there is not enough to hold life in existence, and the patient dies for the want of oxygen.

Death by Convulsions.

Tickling the soles of the feet, irritation of the genital organs by masturbation, irritation of the gums by dentition, irritation of the mucous membrane of the intestines by worms or irritating food, will produce convulsions. Here the convulsions are the result of excitation of the organic nerves of the parts specified. No person can attribute the convulsions produced by irritation of the bowels to the action of the animal or cerebro-spinal nervous system, inasmuch as the intestines receive no nerves from this source.

The mode in which death is caused by tickling the feet will be understood by the continued laughter that is kept up. The organic pulmonary glands become so excited as to be unable to give off electricity to unite with the venous blood; hence it is that the person, after some time, will pant for air, and if the excitement is kept up, fainting will ensue; the countenance will become livid, evidently showing the blood is not oxygenized, and that the person is about losing his life for want of oxygen, which fatality will result if the irritation is continued.

Death by Cold.

170. That when a person is exposed to intense cold in a sedentary position, the temperature of the body and extremities quickly falls below the natural standard; the cold acts as a sedative on the capillary

organic nerves, causing contraction of these vessels, and consequently, preventing the entrance of the blood containing oxygen to unite with the organic nervous glands. The cold air, in its passage into the lungs, after some time, and by degrees, paralyzes the pulmonary organic glands, so as to render them unable to give off enough of electricity to cause the oxygen of the air to combine with the venous blood; hence it is that the person dies in an imperceptible manner, the union between the oxygen and blood having ceased.

Death by Scalds.

171. That when a person is extensively scalded, he will be soon found chilly, and afterwards be attacked with a rigor; here the shock given to the organic nerves of the skin is communicated to the whole organic nervous system, as evidenced by the feeble action of the heart, and impeded respiration. The pulmonary organic nervous glands fail to give off electricity in a sufficient quantity to unite the oxygen of the air with the venous blood; and if the shock is very severe, the pulmonary organic nervous glands fail *in toto* to give off oxygen, and the person dies for the want of oxygen.

Death by Intoxication.

172. That when a person drinks largely of intoxicating liquor, that the organic nerves of the stomach are stimulated; that the stimulation is conveyed to the cardiac ganglion by the par vagum, whose branches inosculate with the stomachic branches of the organic nerves; that the heart pulsates stronger in consequence of the stimulus; that respiration is hurried in consequence of the stimulation of the pulmonary organic ganglion; that the central superior organic ganglion is also stimulated through its connection with the stomach by the par vagum, indicated by the tottering gait of the individual when he attempts to walk. The will commands the lower extremities to walk, but stumbling is the result, the central superior ganglion being unable to guide or regulate the action of the prævertebral ganglia, on whose action the regular contraction of the muscles depend to suit the requirements of the mind. If the stimulus continues to be imbibed to excess, the organic pulmonary glands become exhausted in consequence of the previous excitement, and by degrees lose the power of giving off electricity to unite the oxygen of the air with the venous blood; in due time all power ceases, and the person dies for the want of oxygen.

Death by Typhus Fever—Good Effects of Stimulants and Nourishment.

173. That when a man is attacked with low typhus fever, he will be found probably, on the fourteenth day of the attack, lying on his back, sinking down in the bed, with a quick, small pulse, laborious respiration; his tongue covered with sordes, dry, cracked, and contracted; his abdomen tympanitic; his surface cold; the discharge from his bowels involuntary, with either incontinence or retention of urine; in addition, the patient will pick the bed-clothes and mutter in an incoherent manner. Here, the organic nervous system is suffering from the immaterial poison communicated to it in the manner already described. The pulmonary organic nervous glands are rendered unable to give off enough of oxygen to combine with the venous blood, and ultimately succumb under the deadly influence of the poison; death being caused by the want of oxygen to combine with the organic nervous glands and ganglia.

174. In a case such as the one above described, the administration of beef-tea, made salty, in liberal quantities, as well as the free imbibition of French brandy punch, is attended with wonderful effects. The brandy stimulates the organic nerves of the stomach and bowels; the result is a revolution in the bowels, announced by a discharge of flatus; the heart beats slower and stronger; the respiration becomes easy; the tongue gets moist at the top and edges; the subsultus subsides; and the patient, in a word, shows marked indications of improvement. The muriate of soda causes thirst, almost a certain indication that more oxygen has passed into the venous blood; the salt stimulates the organic nerves of the stomach, which stimulus is communicated to the pulmonary organic glands through the connection with the par vagum. Here the stimulus is communicated by the par vagum to the cardiac ganglia, thus stimulating the heart through the nerves derived from the cardiac glanglia, and to the pulmonary organic glands, to the superior cervical ganglion by its communication by the par vagum, announced by the subsidence of the subsultus tendinum. The beef-tea does essential service, as it is quickly converted into blood, affords nutriment, and renovates important organs, besides affording a better medium for conveying the oxygen from the lungs to the organic ganglia and glands; thus keeping life in existence until the poison is worn out of the organic nervous system, as it certainly will be after a certain period.

Death by Tartar-Emetic, Arsenic, and Corrosive Sublimate.

(THE FIRST GIVEN AS AN EXAMPLE.)

175. That the tartar-emetic first stimulates the organic nervous glands of the stomach, causing vomiting by contraction of the muscular fibres of the stomach, and next purging by irritation of the mesenteric organic nervous glands, inducing copious serous discharges from the bowels; the depression which follows is propagated by the par vagum to the cardiac ganglia, and is thus propagated to the heart and the pulmonary organic glands. The action of the heart becomes feeble, the pulse intermits; the surface becomes cold, the countenance depressed. The patient at this time feels extreme exhaustion, and may die at any moment, in consequence of the pulmonary glands being unable to give off electricity to unite the oxygen of the air with the small quantity of venous blood that is left. The patient dies for the want of oxygen, as well as blood to unite with it.

Death by Hydrocyanic Acid.

176. That when a person takes a large dose of hydrocyanic acid, it produces a direct and instantaneous sedative action on the organic nerves of the stomach; the sedative action is instantly conveyed by the par vagum to the cardiac ganglia, whose branches inosculate with the stomachic nerves. The sedative action of the hydrocyanic acid is next propagated to the nerves of the heart as well as pulmonary organic nervous glands, suspending at the same moment the action of the heart, and the giving off of electricity by the organic nervous pulmonary glands, causing instant death for the want of oxygen to combine with the organic nervous glands and ganglia.

Death by Drastic Purgatives—Elaterium, Gamboge, Jalap, Hellebore, Scammony, Sulphate of Soda.

(THE FIRST GIVEN AS AN EXAMPLE.)

177. That elaterium, when given in a large quantity, will act on the organic nervous glands, on the mucous membrane of the intestines, causing an immense discharge of serum from the bowels, is well known. The poison stimulates the organic nerves of the mesenteric capillary arteries; the result is, the admission of a greater quantity of blood, with an increased amount of oxygen; the glands are thrown into excited action; the electricity evolved at the moment of the oxygen uniting with the organic nervous glands decomposes the serum

of the blood, the hydrogen of which unites with the oxygen and salts of the blood eliminated in the gland, forms serum, which passes off by the bowels. The serum of the blood is then rapidly drained off, the surface of the body becomes cold, the heart pulsates feebly, the pulse intermits, the patient is exhausted to the lowest degree, and gasps for air. Here the patient is placed in the same position as a person suffering from great loss of blood; there is no blood to convey the oxygen to the organic nervous glands and ganglia. The person, therefore, dies for the want of oxygen to combine with the organic nervous glands and ganglia.

Cause of Death by Veratrum Viride—Digitalis—Hyoscyamus—Conium.

(THE FIRST GIVEN AS AN EXAMPLE.)

178. That when veratrum viride is taken into the stomach in an overdose, it acts as a direct sedative, as announced by the feeble action of the heart, the intermittent pulse, the pale countenance. Here the sedative action is communicated to the heart by the cardiac ganglion, through its connection with the par vagum, to the pulmonary organic glands derived from the pulmonray ganglion through the connection with the par vagum. Here the organic pulmonary glands fail to give off electricity to unite with the venous blood; the patient dies, therefore, for the want of oxygen to combine with the organic nervous ganglia and glands.

Cause of Death by Hæmorrhage.

179. That in death by hæmorrhage, caused by the want of blood to convey the oxygen to combine with the organic nervous ganglia and organic nervous glands, that the gasping for breath indicates the action of the organic pulmonary glands to procure air to supply the oxygen to maintain life; that the cold surface demonstrates there is no oxygen to combine with the organic nervous glands; whilst the convulsions that ensue show the struggle that life makes before its departure from its abode.

Cause of Death by Bronchitis.

180. That death by bronchitis, where the bronchial tubes are filled with mucus, is produced by the obstruction given by the mucus to the entrance of the air into the lungs, whereby the operation of the pulmonary organic glands is interfered with, and the consequent union

of the oxygen with the blood interrupted; hence death is caused by the want of oxygen to combine with the organic nervous glands and ganglia.

Cause of Death by Fracture of Cervical Vertebræ.

181. When a man, in consequence of a fall from a height, gets a fracture of the third cervical vertebra, he will be found unable to move any part of himself, with the exception of his head. His will cannot influence the motion of his extremities, as the spinal cord, the chief messenger of communication to them by its connection with the spinal nerves, is cut off by the pressure of the fractured bone. Generally, in from two to four days, the patient dies suddenly; perhaps whilst eating or drinking, or at a time when least expected. Here it will be recollected the cardiac nerves which arise from the cervical ganglia go to form the cardiac ganglia; any violence done these nerves is communicated to the cardiac ganglia; hence the sudden cessation of the heart's action, as well as the sudden cessation of the functions of the pulmonary organic glands derived from the pulmonary ganglion. Death is thus caused by the want of oxygen to combine with the organic nervous glands and ganglia.

Cause of Death by Delirium Tremens—Proper Mode of Treatment.

182. That when a man addicted to habits of intemperance for several years, and who has had three or four attacks of delirium tremens, gets the disease for a fifth time, his animal and organic nervous systems will be found greatly disarranged. The derangement of the former indicated by spectral illusions and erroneous ideas. The derangement of the latter made manifest by the general tremor of the muscles, the soft, weak pulse, and the fluttering of the heart. A patient thus circumstanced may prolong life for a few days, when death will close his career either by convulsions or sudden dissolution. I do not include coma, as I think when a patient dies in this condition, it is from overdoses of narcotics. Here the pulmonary organic glands fail by degrees to give off enough of oxygen to combine with the venous blood to hold life in a vigorous condition; hence the tremor of the muscles; hence the weak action of the heart and arteries; hence it is that if venesection is practiced the doom of the patient is sealed, inasmuch as the removal of the blood removes the medium of conveying the oxygen to the organic glands and ganglia, as well as depresses the organic ganglia by its sedative action. Here, the rational method of

treating delirium tremens is made manifest, namely, keeping the patient perfectly quiet; keeping him in a dark room, and supplying him freely with soups of the richest kind; the blood is thus increased in quantity, the organic ganglia are invigorated, the pulmonary organic ganglia are enabled to give off more electricity to unite the oxygen with the venous blood, which is also increased in quantity, and by which the various organs are renovated; thus it happens that a patient will recover, who, if treated with large doses of opium, would most unquestionably fall a victim to the disease. (The merit of the rational treatment belongs to Drs. Dunglison and Barnes.)

Cause of Death by Tetanus—Mode of Treatment.

183. That when a person gets a punctured or lacerated wound in the palm of the hand or sole of the foot, he is liable to be attacked with spasm of the muscles of the face, neck, and trunk after some days. After the lapse of three or four days from the date of the attack, the patient generally dies. Here spasm of the arytenoid muscle closes the glottis, so that no air can enter the lungs; no oxygen can consequently be given to the venous blood. Death therefore takes place from the want of oxygen to combine with the organic nervous glands and ganglia. Tobacco and chloroform afford the best remedies for curing a patient with lock-jaw, together with as much nutriment as possible. The former allay spasm, the latter to be converted into blood, "the life of the flesh."

Cause of Death by Strychnine.

184. That when a large quantity of strychnine is taken into the stomach, or applied to a blistered surface, or injected into the rectum, spasm of the muscles of the neck, trunk, and extremities will be the result, accompanied with great agony. Here the strychnine acts as an irritant on the organic nervous system, and death closes the scene by closure of the glottis, produced by the spasmodic action of the arytenoid muscle, which closes the glottis, thus preventing the entrance of air into the lungs. The patient, therefore, dies for the want of oxygen to combine with the organic nervous glands and ganglia.

Cause of Death by Tobacco.

185. That tobacco given as an enema or taken into the stomach, or applied extensively to the surface of the body, will produce intolerable nausea and vomiting, accompanied by extreme prostration,

pale countenance, feeble pulsation of the heart, complete relaxation of the muscles, and sudden death, is well known. Here the tobacco poisons or acts as a depressing agent on the organic nerves of the stomach, of the organic nerves of the heart, of the organic pulmonary glands, depressing them so as to be unable to give off electricity to combine the oxygen of the air with the venous blood; hence the coldness of the surface for the want of oxygen; hence the sudden dissolution of the patient, in consequence of the want of oxygen to combine with the organic nervous glands and ganglia, is easily accounted for.

Cause of Death by Dropsy.

186. That as dropsy is the effect either of diseased heart, lungs, liver, or kidneys, it is merely intended to show cause of death by ascites where a patient has been subjected to paracentesis several times. In cases of this kind all the serum of the blood is drained off, until there is not enough of blood left to convey the oxygen to the organic nervous glands and ganglia; hence the patient eventually dies for want of oxygen. Previous to death closing the scene, the patient becomes emaciated to the lowest degree.

Cause of Death by Rupture of an Aneurism.

187. That when an aneurism is ruptured, the blood is directed out of its natural course; consequently none is sent to the lungs, and the patient dies for want of blood to convey the oxygen to the organic nervous glands and organic ganglia; hence the coldness of the surface; hence the pale countenance; and hence, in some instances, the speedy or instantaneous dissolution of the patient is readily explained.

Death by Chronic Diarrhœa.

188. That during the famine years, the poor people of Ireland were compelled to subsist on vegetables or garbage, as well as to drink copiously of cold water to allay thirst; hence in a short time they were attacked by diarrhœa, which closely resembled the action of mild aperients continually administered; in a short time they became weak, pale, and emaciated. In this condition they applied to the relieving officer, who either gave them out-door relief, or had them admitted into the workhouse. The diet in the workhouse for an able-bodied man consisted of sixteen ounces of Indian meal and one quart of buttermilk; thus giving eight ounces of meal for stirabout in the morning, with a pint of buttermilk, and the same quantity of meal for stirabout and a pint

of milk for dinner. No supper was allowed. This diet, instead of arresting the diarrhœa, in many cases brought diarrhœa on. The poor people invariably applied to the medical officer for change of diet, namely, bread and milk, which improved their condition; in some cases, however, notwithstanding the change of diet, and the liberal administration of stimulants and proper nutriment, the patient continued to crave for more food and drink, yet became amazingly emaciated; the discharge from the bowels of a fluid resembling water in which cabbage had been boiled, continuing to harass the patient several times in the twenty-four hours. The patient would remain probably for some weeks in the condition described, when he would request admission into the Infirmary, being no longer able to sit up or walk about in his ward. The patient at this time would present a haggard countenance, sunken eyes, clammy skin, either no pulse at the wrist, or one scarcely perceptible; on examining his abdomen, the umbilicus would appear as if resting on the body of the lumbar vertebræ; in other words, the abdomen would seem completely empty of its contents, and the whole contour of the patient would remind the observer of a living skeleton. Here it is to be remarked, the patient might survive for four or five days without the pulse being perceptible at the wrist, with the action of the heart exceedingly feeble, respiration scarcely perceptible, and the surface of the body cold; the patient at length dying without a struggle. The cause of death is now easily explained. The organic pulmonary glands daily losing the power to give off electricity to unite the oxygen of the air with the venous blood; the quantity of blood daily reducing to convey the oxygen to the organic nervous glands and ganglia. Death is caused eventually by want of blood to convey the oxygen to the organic ganglia and glands.

Proof that Poisons do not act by Absorption, but on the Organic Nerves of the Part to which they are immediately applied.

189. That when syphilitic poison is applied to the glans penis, after the lapse of some days tingling will be felt, to be followed in due time with a papilla, vesicle, pustule, chancre or ulcer. Here it is evident if the poison was absorbed and got into the circulation, that not only one ulcer, but numerous ulcers, should be found all over the body. Here the poison acts on the capillary organic nerves of the capillary arteries. That when the ulcer heals up, and hardness continues to point out the site of the ulcer, that the patient is almost certain to be attacked with secondary symptoms; thus showing that the poison is still lo-

cated in the part, and that the organic nerves are imbued with the poison.

190. That when a person is bitten by a rabid animal, the wound will heal, and continue healed for two, three, or four months; but if the person is about being attacked with hydrophobia, the wound will be found inflamed; thus showing that the poison has been located in the wound during the whole period.

191. That when a child is vaccinated, the little wound will not show any evidence of the poison for about four days, when a papilla will be observed, accompanied by heat and redness, to be followed by a vesicle on the eighth day. Here it is to be remarked, if the poison acted by absorption, the whole body should be covered with vesicles; hence the organic capillary nerves of the arteries of the part are solely implicated by the poison.

192. That when a man gets a dissecting wound in making a post-mortem examination of the body of a person who has recently died, as soon as the constitutional symptoms set in, a vesicle will be found corresponding to the wound; showing that the poison has acted on the organic nerves of the part wounded.

193. That when a drop of hydrocyanic acid is dropped on the tongue, it produces instant death. Hence it is manifest there is no time for absorption. The acid acts by its sedative action on the organic nervous ganglia, paralyzing the pulmonary organic ganglia, whereby they are unable to discharge their functions of causing the union of the oxygen with the venous blood by the evolution of electricity.

194. That when strychnine is applied to an abraded surface, it instantly produces spasm of the muscles. Here there is no time for absorption; the poison acts on the organic nerves, irritating them; hence the spasm of the muscles that ensues.

195. That when sulphate of zinc is taken in a large dose, it is immediately rejected by the stomach. Here there is no time for absorption. The zinc acts as an irritant on the organic nerves of the stomach. Contraction of the muscular fibres of the stomach is the result, and hence the vomiting that follows.

196. That poisons act on the organic nerves surrounding the capillary arteries and the organic glands in which the capillary arteries terminate, and the capillary veins commence. And that after some time the blood on passing through the gland becomes poisoned. That the venous blood thus poisoned is conveyed to the right side of the heart, next to the lungs, where the oxygen unites with it, and next to the left

side of the heart, when it circulates through the arteries, and on the union of the oxygen with the organic glands communicates the poison to them. Thus the mode in which secondary syphilis takes place; the mode in which hydrophobia takes place; the mode in which the constitutional symptoms resulting from a dissecting wound are produced; the mode in which the fœtus in utero is inosculated with the virus of small-pox, or the syphilitic virus is explained.

197. That when arsenic is applied to an ulcer, it poisons the capillary organic nerves surrounding the arteries, as well as the organic ganglia; the blood, on passing through the ganglia, is poisoned and conveyed to the right side of the heart and lungs; that the blood, on being arterialized, is conveyed to the left side of the heart, and circulated through the arteries, and on the union of the oxygen with the organic nervous glands the poison acts directly on the organic nerves of the stomach.

198. That when mercurial ointment is applied to the surface of the skin, it acts on the capillary organic nerves surrounding the arteries, the organic gland, and next the blood; that the blood, thus charged with the mercury, communicates the stimulus of the mercury to the organic nervous glands, or the union of the oxygen of the blood with them, and that the peculiar action of the mercury is made particularly manifest on the salivary glands.

Medicines Act as Antidotes.

199. That as strychnine produces spasm of the muscles by its action on the organic capillary nerves and ganglia, and as tobacco produces relaxation of the muscles by its action on the capillary organic nerves, it is evident that tobacco is the medicine calculated to relieve a patient suffering from strychnine.

200. That as ipecacuanha will produce an attack of asthma by causing spasm of the pulmonary organic glands, and as chloroform will allay the spasm of the organic nervous glands, it follows as a consequence that chloroform would prove serviceable when an attack of asthma is brought on by the vapor of ipecacuanha.

201. That when the peristaltic motion of the intestines is rapidly increased by the action of purgative medicines, such as epsom salts, jalap, castor oil, or calomel, opium will arrest the peristaltic motion of the intestines, by its stimulating effects on the mesenteric organic capillary nerves and glands. Opium causes contraction of the iris, which is a circular muscle, capable of dilatation and contraction, on

the same principle as the muscular fibres of the intestines contract and dilate. The opium, therefore, causes contraction of the intestinal tube, allays pain, and arrests the discharges from the bowels.

202. That when tobacco is taken into the stomach, rectum, or locally applied, it depresses the organic nervous glands and ganglia, by its sudden and deadly operation. As brandy produces a totally different effect on the organic nervous glands and ganglia by stimulation, it therefore follows that brandy should be administered when a patient is suffering from the pernicious influence of tobacco.

203. That when a person is suffering from the effects of inhalation of chloroform, ether, diluted carbonic gas, diluted sulphureted hydrogen gas, where the pulmonary organic nervous glands are rendered almost powerless to give off electricity to unite the oxygen of the air with the venous blood, electricity should be had recourse to, and one pole of a galvanic battery should be applied to the cervical organic ganglia, and the other over the cardiac ganglia; thus the current would be made to pass in such a direction as to stimulate the pulmonary organic ganglia, and thus enable them to discharge their functions, by giving off electricity to unite the oxygen with the venous blood.

204. That as the application of hot water will cause irritation of the organic nervous capillary glands, causing dilatation of the capillary arteries, with the consequences of the effusion of lymph and serum, and as the application of cold water will produce an opposite effect on the organic capillary glands, it follows that cold should be immediately applied when a person is scalded in a hot or boiling fluid.

205. That when a person takes belladonna into the stomach to excess, it produces alarming symptoms; the pupil becomes dilated to a very great degree. As opium will cause great contraction of the iris when taken in an overdose, it follows that opium should be given when a person is suffering from the effects of belladonna.

206. That as digitalis will depress the organic nervous glands and ganglia, causing feeble action of the heart, with intermission of the pulse and cold surface of the body; and as brandy, ammonia, and musk act by stimulating the organic ganglia and glands; it follows these medicines should be given to a person suffering from an overdose of digitalis.

207. That as cantharides irritate the organic capillary glands, and as hyoscyamus allays irritation of the organic capillary glands, it follows as a consequence that hyoscyamus should be administered to a person suffering from the effects of cantharides.

Pathology of Hydrophobia.

208. That in one, two, three, or four months, sometimes a longer period elapses, a person who has been bitten by a rabid animal will observe some change in the appearance of the part where the wound was inflicted; either pain, redness, or discoloration of the skin will attract his attention. After some time, the well-known symptoms which characterize hydrophobia will present themselves. The great thirst, with the apprehension of swallowing fluids—the frightful spasm of the glottis, with all the muscles of deglutition, on attempting to swallow—the presence of viscid saliva, which harasses the patient, and which he frequently attempts to spit out—the snapping with the teeth—the rolling of the eyeballs—the paroxysm of strangulation, brought on by hearing water poured from one vessel into another—the paroxysm brought on by looking into a mirror—sometimes the bad odor that annoys the patient, as well as the sudden death of the patient—all demonstrate that the spheno-palatine ganglion is in a morbid state of irritation. The connection and distribution of the nerves of the spheno-palatine ganglion prove conclusively the truth of this affirmation.

That the spheno-palatine ganglion is connected with the superior division of the fifth nerve, (the superior maxillary nerve.) It is connected with the superior cervical ganglion. The spheno-palatine ganglion is connected with the ear by the vidian nerve, and with the submaxillary gland by the chorda tympani nerve. The superior cervical ganglion is connected with the lenticular ganglion by a branch of communication. The spheno-palatine ganglion sends nerves to muscles concerned in deglutition; sends nerves to the arytenoid muscle: hence the spasm of the muscles can be accounted for. The rolling of the eyes can be accounted for by recollecting the inferior oblique muscle is supplied with a nerve from the lenticular ganglion; the alternate relaxation and contraction of these muscles cause the rolling of the eyes. The connection of the vidian nerve with the ear accounts for the bad consequences resulting from certain sounds. The secretion of the viscid saliva is accounted for by the connection of the chorda tympani with the submaxillary gland; the snapping with the teeth is accounted for by the connection of the dental nerves with the spheno-palatine ganglion, through the connection of the superior maxillary nerve, from which the dental nerves take their origin. The sudden dissolution of the patient is caused by spasm of the glottis; the non-admission of air

into the lungs accounts for the cause of death—namely, the want of oxygen to combine with the organic nervous ganglia and glands.

209. That as a further proof that the spheno-palatine ganglion is the organ morbidly affected when hydrophobia is present, it is almost unnecessary to remark, that the saliva in a rabid animal is secreted under the influence of the spheno-palatine ganglion, through the operation of the chorda tympani division of the vidian nerve, which takes its origin from the posterior part of the spheno-palatine ganglion.

210. That again, when a venomous reptile wishes to inflict a deadly wound, he communicates his wishes to the spheno-palatine ganglion, through the superior maxillary division of the fifth nerve; and the latter to the submaxillary glands, through the chorda tympani nerve, to the submaxillary gland. The connection between the animal and organic nervous systems is here made manifest.

230 Washington Square, South,
New York, 4th Feb., 1861.

NOTE.

In the foreign correspondence of the *American Medical Times*, for January 19th, 1861, will be found a letter from David P. Smith, M.D., in which the following paragraph occurs: "Professor Simpson regards the fact that there is no nerve-fibre in the umbilical cord, as proof positive that there can be no influence exerted by the imagination of the mother upon the fœtus in utero."

Professor Simpson's name must always command respect and attention, but a man cannot deny the evidence of his own senses. I distinctly recollect the particulars of four cases where impressions made on the minds of the mothers were conveyed to the fœtus in utero. In one case, a woman in the last month of pregnancy had presented to her the dead body of her husband, who had been kicked to death by his horse. In some days afterwards she was delivered of a son, who, when I saw him at the age of three years, presented all the characteristics of an idiot. In another case, a woman witnessed a frightful accident befall her husband during the last days of her pregnancy; in due time she was delivered, and the child, a daughter, when I saw her was over three years old, had the characteristics of idiocy, as well as a convulsive movement of the muscles resembling paralysis agitans.

In a third case, where a woman in the last month of pregnancy had been robbed of the hard earnings of herself and husband, which she had deposited in a chest, sustained a tremendous shock, rendering her almost powerless to do anything for some time, was shortly afterwards delivered of a son, which is now perfectly idiotic.

In a fourth case, a woman sustained a great fright, in consequence of her husband having received injuries by machinery; she was soon afterwards delivered of a child, which she brought to me at the age of three months, in consequence "of a beating of the heart." I examined the little patient, and with the exception of the increased action of the heart, there appeared to be nothing whatever wrong.

I would respectfully refer Professor Simpson and others, who are skeptical with reference to nerve-fibres in the cord, to Mr. Swan's admirable description of the organic nervous system in the boa constrictor. Mr. Swan says, "*This plexiform structure varies in different parts, and becomes much greater about the beginning of the intestines, where it resembles that corresponding with the semilunar ganglion in the turtle; near the kidneys it assumes the form of a* NERVOUS MEMBRANE or RETINA, before it is distributed on the URINARY and GENERATIVE ORGANS." It is evident that the genital and urinary organs of the boa constrictor are enveloped in a RETINA of ORGANIC *nervous membrane*. It must be evident to every anatomist, that it would be very difficult to demonstrate this nervous membrane by dissection; hence the analogy between the genital and urinary organs of the boa constrictor and the hypogastric and uterine arteries as regards the actual demonstration of the organic nervous membrane.

It is to be recollected when the cord is being divided, the infant almost invariably gives evidence of suffering pain. Unless the cord contained nerves, there should be no pain.

COURSE OF LECTURES

ON THE

PHYSIOLOGY AND PATHOLOGY

OF THE

CENTRAL NERVOUS SYSTEM.

By C. E. BROWN-SEQUARD, M.D., F.R.S., &c., &c.

(Just Published.)

Dr. C. E. Brown-Séquard states that section of the cervical sympathetic is attended with the following phenomena:

1. *Dilatation of the blood-vessels.*
2. *Afflux of blood.*
3. *Increase of vital properties.*

Which he attributes to PARALYSIS of the *blood-vessels*, causing *more blood* to pass through the vessels *in a given time*, producing an *increase* of the *vital* properties of the contracted and narrow tissues. He says that himself, Drs. Waller, Donders, and others, have proved by experiment that whatever may be the cause of *increasing* the *circulation* of blood in the blood-vessels of the head in *a given* time, produces almost all, if not all, the phenomena following section of the cervical sympathetic.

Galvanization of the cervical sympathetic causes—

1. *Contraction of blood-vessels.*
2. *Diminution of blood.*
3. *Decrease of vital properties.*

Dr. Brown-Séquard says the result of the experiments by section of the nerves, as well as by galvanization, shows "the *untenability* of a *vitalistic* theory, according to which the normal actions of the sympathetic nerve would be *increased* after it has been divided and di-

minished, when it is excited by galvanization; and according to which, also, nutrition and animal heat would be dependent upon the sympathetic nerve, which would produce an increase of these two functions after it had been divided, *(although it ought then to cease to act;)* and a *diminution of these functions* when it is galvanized, *(although* it then ought to *act more than normally.")*

Dr. Brown-Séquard's experiments, although they resulted diametrically opposite to what he expected, and were followed by effects contrary to what in his mind should be anticipated, yet prove conclusively the doctrine I have propounded. The section of the nerve *irritates, not paralyzes*, the sympathetic nerve; hence the phenomena described by Dr. Brown-Séquard were just what should be expected from irritation of the nerve.

With respect to the application of galvanism to the nerve *decreasing* instead of *exciting* the powers of the nerve, the result was such as might be anticipated, on recollecting the galvanic current killed the vital agent in the nerve precisely as electricity or lightning destroys life by the shock communicated to the organic nervous system. The cervical nerve is an organic or vital nerve, and differs in this respect from an animal nerve, that may have a galvanic current sent through it with impunity.

Dr. Brown-Séquard asks, "What is the origin of the cervical sympathetic nerve?" Dr. Brown-Séquard answers, that he conceives, with Dr. Waller and Prof. Budge, that the nerve-fibres of the cervical sympathetic that go to the *iris originate* from the *spinal cord.* But this description is met by Dr. Quain's description of the organic nervous system in the acephalous fœtus, as well as by the comparative anatomy of the invertebrata, which have no cerebro-spinal nervous system.

Effects of the section of the cervical sympathetic nerve:

1. Constriction of the pupil.
2. The eye seems to be smaller, or truly shrunk in.
3. The eye is drawn backward, and a little inward.
4. The eyelids are partially closed.

Irritation of the *superior central* ganglion will *produce similar* phenomena to those produced by *irritation* of the *cervical* sympathetic nerve by section, as evidenced by the experiments of Brown-Séquard and Pourfour Du Petit. The results of the experiments are pre-

cisely what should be expected, knowing that the superior central ganglion and cervical ganglion belonged to the same nervous system. What Dr. Brown-Séquard calls PARALYSIS is in truth IRRITATION. What he calls IRRITATION is in truth PARALYSIS. *Section*, or *wounding* the nerve, causes *irritation*. *Galvanism*, or electricity, *destroys* the vital agent in the nerve; hence the *deadly* shock which follows.

I am delighted that my views are confirmed by the distinguished and learned Brown-Séquard. His *experiments* prove the *truth* of the *conclusions* I arrived at with regard to *excitation* and *depression* of the organic *nervous* system.

With respect to Dr. Brown-Séquard's observation that the blood-vessels of the head are supplied with nerves "*chiefly* from the *spinal cord*," "by the roots of the *last* cervical and *first* and *second* dorsal nerves," I apprehend he will find very *few* anatomists to agree with him on this point. *All* anatomists, with the exception of himself, agree that the blood-vessels of the head are supplied with nerves, which form a retina round them, from the cervical organic ganglia. Dr. Grainger has shown that the ganglia are connected by two roots to the anterior and posterior pillars of the spinal cord—the anterior and posterior roots of the spinal nerves. The same arrangement of the animal and organic nervous systems is observed here as is followed all over the body. The animal nervous system is spread out at the termination of the nerves into a network, which *inosculates* with the organic nervous system, at the termination of the capillary arteries.

Having only this day got Dr. Brown-Séquard's work, I have not time to do the work the justice it merits.

J. O'R.

25TH FEBRUARY, 1861.

tiate of the Irish College. It is quite true "that a knowledge of these systems is what must ultimately distinguish the scientific from the superficial physician."

Believe me, dear sir, very faithfully,

WILLIAM HENRY PORTER.

From JOHN W. FRANCIS, Esq., LL.D., M.D., *Ex-Professor of the Practice of Midwifery, &c.*

NEW YORK, *Feb.* 25, 1859.

DR. O'REILLY:

Dear Sir—I have read with care your several papers on the nervous and ganglionic systems. They abound in interesting facts, some of which are new to me.

You must have labored devotedly to bring together such a fund of material, and been an observer of more than ordinary acuteness. You have done well, in my humble opinion, to awaken interest in the Ganglionic System—too much overlooked.

I hope you will prepare your several articles for an entire communication.

Let me thank you, dear sir, for your polite attention.

With true regard and esteem, your friend,

JOHN W. FRANCIS.

From JOHN M. CARNOCHAN, Esq., M.D., *Professor of Surgery; Surgeon-in-Chief to the Emigrants' Hospital, Ward's Island.*

45 LAFAYETTE PLACE, *Feb.* 17, 1859.

MY DEAR SIR—I am much obliged to you for your several articles elucidating the phenomena of various functions and manifestations of some portions of the nervous system.

I have read them with much gratification, and believe you have struck upon a theme replete with much important matter, and from the study and analysis of which many useful revelations are to spring.

I have long thought that medicine has to gain its claim as an exact science through such studies as those with a resume of which you have been so kind as to furnish me.

I am, dear sir, very respectfully yours,

Dr. John O'Reilly. J. M. CARNOCHAN.

Extract from a letter from FORDYCE BARKER, Esq., M.D., *Ex-Professor of the Practice of Midwifery, &c.*

MY DEAR DR. O'REILLY—I have read your papers on the source of Puerperal Hæmorrhage and on the Connection of the Nervous Centres of Animal and Organic Life with great pleasure and profit. I congratulate you on your successful study of important pathological questions on a physiological basis, and I hope your contributions will stimulate a new spirit of inquiry.

From WILLIAM DETMOLD, Esq., M.D.

NEW YORK, *August* 16, 1859.

JOHN O'REILLY, M.D.:

My Dear Dr.—Accept my thanks for your work on the Placenta and its connection with the nervous centres. I have perused it with great interest, and I assure you not without profit to myself.

Believe me, very truly yours,

WM. DETMOLD, M.D.

"The author of this monograph has rare intellectual faculties."—*San Francisco Medical and Surgical Journal.*

"The work standing upon its own merits occupies a high position in the opinion of the most gifted physicians of our day."—*Georgia Med. and Surgical Encyclopædia.*

From DR. D. M. REESE'S *Medical Gazette for March*, 1861.

DR. JOHN O'REILLY, whose original researches in Physiology, and whose untiring industry, have heretofore enriched our pages, has furnished for the present month an elaborate article, which cannot fail to awaken professional interest at home and abroad. Let not its length prevent its candid perusal, for he is one of the few men who refuses to think by proxy.

Dr Harris
253 4th Avenue