ON THE NATURE, SOURCE, AND DISTRIBUTION OF THE

NERVOUS FLUID,

OR ELECTRICITY,

OF THE ANIMAL SYSTEM;

AND OF THE CONNEXION BETWEEN THE MIND
AND THE BODY,
AND OF VITAL TEMPERATURE.

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As the functions of the nervous fluid are "to excite the muscles, to convey impressions to and from the sensorium, to effect the formation of the secreted fluids, and to cause an evolution of caloric from the blood"—and as all these purposes are to be accomplished by galvanism—taken in consideration with the fact, that certain animals are known to generate electricity so abundantly that they possess it as a weapon of offence, and the recent experiments of Dr. Berandi, of Milan, who has proved that needles, thrust through the crural nerves of living animals, become, during the time, electric, and, subsequently, on removal magnetic—a fair deduction, arising out of such a combination of evidence, would appear to me to establish the identity of the nervous with the electric fluid. At least such is the impression upon my mind, and, as such, warrants me, I am of opinion, in assuming it as a fact, which I shall therefore do. I proceed therefore to offer an explanation of its source, which, with that of its distribution, I trust will prove not undeserving of attention, as I am humbly of opinion it will be found satisfactorily to explain many of the phenomena of vital action, both in health and disease, clouded at present in complete obscurity. I may first observe, that it is no secretion of the brain, or spinal marrow, as evinced by the facts, that fœtuses have been born alive without either of these organs, and that animals will live for hours from which both have been removed; and that it is no secretion of the nerves, their structure would lead us fairly to infer, had we not the more complete evidence in the fact, that there are even animals so low in the scale of creation as to be without them. The nerves, therefore, are, it is fair to suppose, but its conductors; and the brain, with its appendage the spinal marrow, its central point and recipient, preparatory to its distribution. Such, I conceive, is a fair inference, and such, I am of opinion, the

evidence I shall adduce will be sufficient to establish as being the fact.

For the elucidation of the subject I must beg to be permitted to introduce a few preparatory considerations on respiration and assimilation. Murray says—"The blood is the source whence the animal products are formed; its expenditure is supplied by the chyle, a fluid less completely animalised than the blood itself. The peculiar character of animal matter, with regard to composition, is, a larger proportion of nitrogen, and a diminished proportion of carbon; it may therefore be inferred, that in the extreme vessels, where the animal solids and fluids are formed, the general process will be, the separation from the blood of those elements of which animal matter is composed, and that of course carbon, which enters more sparingly into its composition, will exist in the remaining blood in an increased proportion. This is accordingly the general nature of the conversion of arterial into venous blood. Nitrogen, hydrogen, and other elements, are spent in the formation of new products, and the proximate principles of the blood, probably the crassamentum chiefly, remain with an increased proportion of carbon."

The chemical changes in the blood, therefore, obviously take place in the arterial capillaries throughout the system, and the blood's exposure to the air in the lungs is but subservient to them, accomplishing the extrication of the carbon in chemical union with the previously-absorbed oxygen, and which as carbonic acid gas is replaced by a fresh portion of oxygen, that now becomes absorbed, while the latter, in its combination with carbon, in the general circulation, is attended with an evolution of heat, in consequence of the diminished capacity of the product for caloric, as the following quotation, extracted also from Rees's Cyclopaedia, will render apparent:—

"These results (alluding to a former paragraph, proving the higher specific temperature of arterial over venous blood, which was computed as 114 to 100) derive confirmation from the experiments of Mr. Colman, who, in order to discover the relative specific heat of arterial to venal blood, strangled a cat, and immediately opened its chest, while the blood in the left ventricle was still fluid. He then introduced a thermometer, through an opening in the pericardium, on each side of the heart, and it stood at 98 deg.; in the left ventricle the blood was only 97 deg.; and in the right, it was nearly 99 deg. In fifteen minutes, however, instead of the blood in the right ventricle possessing two degrees of heat more than the left, it was found to have four degrees less. Sir Asley Cooper repeated this experiment in various ways, and

* Read before the Westminster Medical Society, April 16th, 1831.

found invariably, that although the venal blood was superior in temperature at first, yet before coagulation was complete, the arterial became from three to six degrees warmer. These facts afford clear and decisive proof, that the specific heat of arterial blood exceeds that of the venal; and demonstrates likewise, that this excess is obtained during the passage of the blood through the lungs."

Such then being the source, or principally so, of animal temperature, I shall now proceed in my design to show the source of the electric fluid.

It is an established fact in chemistry, that the decomposition of a compound, or the formation of a new one, is attended with a variation in the electrical capacities of the products—the change manifesting an increase or diminution in this respect, it becoming either plus or minus, latent or evolved.* Now, as the process of accretion, assimilation, and secretion, constituting the change or conversion of arterial into venous blood, so well explained by Mr. Murray in the foregoing quotation, is a chemical process, and as this change, moreover, is attended with the combination of the oxygen with the carbon, of the carbonic acid formed, and as experiment has proved such combination of oxygen, or combustion of carbon, to be attended with an evolution of positive electricity, I may fairly assume the chemical change, or conversion of arterial into venous blood, at the termination of every arterial ramification throughout the system, is not only attended with an evolution of caloric, but of electricity also. Hence from the first, the body's temperature, and its equal diffusion; and from the second, its nervous or electrical excitement, or vitality,—the former of which, or its caloric, being abstracted by the surrounding media from the superficies of the body, or in conjunction with the perspirable and bronchial secretions, is exhaled in the form of vapour from the skin and lungs. The latter, or electrical evolution, which I believe to be in a ratio with the caloric and chemical change that has taken place, having its source in the capillary circulation, explains the reason why vitality goes on in these vessels for a considerable time after the apparent death of an animal, and the irritability of muscular fibre, after the appearances more particularly denoting life have long ceased. And it explains also the reason why the arteries, after death, are found empty; arterial blood being the stimulus to action, and support of capillary circulation, as long as this is furnished, capillary action continues, which necessarily empties the arteries of their contents.

* A striking illustration of which at once presents itself in the galvanic trough.

Another argument that may be adduced, favouring this view of the body's electrical generation, is the fact, that a capillary tube is quite impervious to a fluid, but under the excitement of electricity admits its passage freely. Now, as the capillary vessels are so minute that they are not discernible by the naked eye, but with a microscope the blood's free passage is to be seen through them, we are warranted in supposing, that the circulation in these vessels may be excited by the same means; as it has been proved by experiment, that it is no impulse of the heart, nor action of the arteries, that carries on the circulation in these vessels, as it still goes on long after the heart has been removed from the body, and the action of the arteries ceases. And further, it has been proved, by removing both brain and spinal marrow, that the excitement of these vessels is not derived from the brain and nerves. The only essential to their action I believe to be the due oxygenation of the blood, as this is not only essential to the abstraction of a deleterious principle from the blood, but to the chemical changes connected with the evolution of both caloric and electricity; the indispensable stimuli to all vital phenomena, and which I believe the oxygen alone furnishes. This, I am of opinion, is made manifest in the incubation of the egg, oxygenated air, and a certain temperature, being the only essentials to the process; and also, in the development of the fœtus in utero, the mother imparting only oxygenated blood, which alone possesses all the materials of its structure and vitality. Many other arguments might be adduced in support of the same views, but I shall content myself at present with adding, that the experiments of Dr. Philip proved, that capillary circulation was dependent on respiration (admitting as he does, that the laws which regulate the power of the vessels of circulation are the same with those which regulate that of the heart), inasmuch as the action of the heart ceases on respiration being discontinued, and is restored by its restoration. This appears to me to admit of no other explanation, and I should say is confirmed by the experiments of Dr. Berandi, who found the development of electricity by the nerves to bear reference to the perfection of the respiratory process, and to be increased by the inhalation of oxygen gas; and, on the contrary, to be suspended when the animal was made to respire hydrogen or azote. It may be asked, for what then are the capillaries so amply furnished with nerves? I should reply, to determine their action or direct their innutrition, secretion, &c., which being organic, or vital, functions, are supplied by the sympathetic.

The explanation offered appears to me

as complete and satisfactory as well can be desired; and as much so, perhaps, as the case admits of, leaving hardly a doubt on the mind of the origin of the nervous or electrical fluid of the animal being such as I have suggested.

The electricity thus generated, I am further of opinion, is transmitted by the most perfect conductors of the animal textures—the nerves, to their source, in the common acceptation of the word, and its receptacle—the spinal marrow and brain, exciting the sensorium to the various operations of the mind, and the organs of sense to their respective functions, and is again transmitted by the nerves, at the pleasure of volition, in the several actions of muscular contraction, or is conveyed by the pneumo-gastric and respiratory nerves to the respective organs and functions to which they communicate excitement, and hence the intimate connexion and remarkable sympathy existing between the head and stomach or liver, and an explanation why mental emotions, or great muscular exertion, so immediately derange digestion, and the functions of the several organs to which these nerves are transmitted, by withdrawing from the stomach and these several organs that stream of excitement which is necessary to the secretive and digestive processes.

Of the hybernation of animals, too, these views offer a very satisfactory explanation, as well as some other of the phenomena of vitality, which I shall mention. The atmospheric temperature, by the withdrawing of the sun's influence, being reduced below that degree which is compatible with the perfect action of the cutaneous and pulmonary capillaries, their function, in the extrication of carbon and absorption of oxygen, is but imperfectly effected, and, by consequence, the chemical changes connected with the evolution of caloric and electricity are so much diminished, that the quantity of these generated are not equal to the excitement of the respiratory muscles and organs of sense, and hence the cessation of their action, and the profound sleep which ensues. But as the temperature of these animals, by their timely withdrawing into holes and comparatively warm situations, is not reduced below that state which is compatible with a certain degree of respiratory action being carried on by the cutaneous surface, organic or vegetable life still continues. Hence Spallanzani found, that torpid animals, where respiration had entirely ceased, carbonated the air in which they were confined. And in this state of vegetable existence or torpidity they remain, till the genial warmth of spring restores the respiratory office of the lungs, and with it animal life. This is analogically well illustrated in the vegetable kingdom,

the warmth of spring expanding the sap, relaxing the cutaneous or barky surface, and thus favouring atmospheric absorption and the chemical processes of vegetable life; and with it secretion, and the budding and development of the leaf or lungs, under the influence of which, the more complex actions of impregnation and fruition ensue, differing but little from animal reproduction. And conversely thus it is with the fœtus in utero, like unto the hybernating animal; defectively oxygenated blood, for so it must be circulating in the fœtus, secluded from aerial influence, and renewing but a portion of its blood by an interchange with its mother, is productive only of that quantity of electricity necessary to its development and vegetable existence, and still compatible with the non-performance of the respiratory action, and numerous functions of animal life. And thus it is when its development and growth are complete, and by consequence the quantity of electricity generated more than equals the necessities of its condition, excitement is communicated to its containing organ and uterus, and hence is its expulsion effected, and respiratory action immediately follows.

It will be noticed, that I attach to the nerves the twofold office of being the conductors of electricity from its source in the capillary circulation, and of conveying it to the muscles of volition and organs of secretion. That they fulfil both these offices I think there can be no doubt, since Mr. Charles Bell has demonstrated that each nerve proceeding from the spine consists of a bundle of fibres enclosed in the same common sheath—some, I would add, proceeding from, and others to, the spine,—one set, it has been proved by Messrs. Bell and Magendie, originating in the posterior roots being connected with sensation, and the other with the anterior portion of the spine, and with motion. The branches connected with the posterior roots I would therefore denominate the converging fibres, or conveyancers of the electric fluid and impressions from their source to the spine and brain, and those of the anterior, the diverging being charged with electricity from the spine and brain, to carry volition into operation in the excitement of muscular contraction.

If such be the case, it next becomes a question how the action of the involuntary muscles is effected. These, it will be remembered, receive their nervous excitement from the sympathetic. This nerve, contrary to all other nerves of the body, has no particular origin, but is formed, I should say, by the filaments given off by every nerve of sensation, whether proceeding from the spine or the brain, and with which it holds communication through the intervention of

a ganglion, the office of which may be to cut off or prevent the communication of sensation to the vital organs, or as a knot of interruption, by which the wants of the sympathetic are first provided. Hence the organs to which the sympathetic is distributed, being in function primary in the scale of animal existence to the brain and spinal marrow, will be the first to receive electrical excitement, and the last to lose it, as long as the fluid is generated, and transmitted from all and any part of the capillary system; and thus it is, after the apparent death of an animal, the senses having fled, and the powers of volition ceased, that the peristaltic motion of the stomach and intestines still continues for a considerable time, and the capillary circulation to some extent long after this has failed.

In support of these views I shall make a few extracts from Dr. Philip's "Enquiry into the Laws of the Vital Functions," and offer some remarks upon the deductions he arrives at, from his numerous and well-conducted experiments. 1st. He proved "that the capillary vessels possess a power capable of supporting a certain motion of the blood independent of the heart, by the following experiments:—a ligature was thrown round the vessels attached to the heart of a frog, and the heart was then cut out; on bringing the web of one of the legs before the microscope, the circulation was found in it to be vigorous, and continued so for many minutes, gradually becoming more languid." The like experiment was tried upon a rabbit, and "the blood was found to be moving freely in the capillary vessels of the mesentery an hour and a quarter after the heart had been removed;" and Dr. Philip adds, "that he has no doubt the same action continues for several hours, as this was noticed in a rabbit which had been thrown aside with its bowels hanging out from an opening into the parietes of the abdomen, and exposed to the air, by which it was quite cold."

2nd. He proved that "the power, both of the heart and vessels of circulation, is independent of the brain and spinal marrow," by numerous experiments. The following may be adduced as, in every respect, satisfactory: "The brain and spinal marrow of a frog were removed at the same time; on opening the thorax, the heart was found performing the circulation freely." "The spinal marrow of a rabbit was laid bare from the occiput to the beginning of the dorsal vertebræ, the circulation being supported by artificial respiration. The chest was then opened, and the heart found beating regularly and with considerable force; the spinal marrow, as far as it was laid bare, was now removed, without in the least affecting the heart's action; after this, the arti-

ficial respiration being frequently discontinued, the action of the heart was repeatedly seen to become languid, and increase on renewing it. The skull was then opened, and the whole of the brain removed, but without any abatement of the action of the heart, which still continued to be more or less powerful, according as we discontinued or renewed artificial respiration; this being for a considerable time discontinued, the ventricles ceased to beat about half an hour after the removal of the brain; but on renewing respiration, the action of the ventricles was restored, the respiration was again discontinued, and renewed with the same effects." In another experiment, "A strong ligature was thrown round the neck of a frog, and the head was cut off without any loss of blood (much loss of blood immediately destroys the circulation in the extremities); the spinal marrow was then destroyed. On bringing the web of one of the hind legs before the microscope, we found the circulation in it vigorous for many minutes, and in all respects resembling that in the web of a healthy frog."

Dr. Philip, in concluding these experiments, observes, "Does it not seem a necessary inference, that the action of the heart and vessels of circulation, depends upon a power inherent in themselves, and having no direct dependence on the nervous system? It assuredly does; and does not my explanation of these phenomena afford a satisfactory solution of these points, viz., that the action of vitality commences in the capillary arteries, under the excitement of the blood, and that the heart's irritability is dependent on the same cause, viz., its structural capillary circulation, and its excitement as a muscular organ, derived from the sympathetic—as a collector of electricity from all quarters; aided, though, no doubt, by the stimulus of the blood, and its warmth on its internal surface, and the irritation of distension: it is, however, a question in my mind, if this latter is not attributable to the influence and excitement that it imparts to its structural circulation, as a moment's reflection will point out to us, that the distension of the aorta would appear essential to the coronaries of the heart being duly furnished with blood. It is probable, I am also of opinion, that the heart's action may be excited to a certain extent by the electricity of its own generation, and the same probably obtains with the other organs of involuntary muscular action; as these organs have no conducting nerves, or such as we have so denominated, which abstract this influence from other parts of the system. Hence it is, that the heart of cold-blooded animals will continue to beat for hours after removal from the body. Why this only takes place in cold-blooded animals,

I conceive fairly attributable to difference of temperature, every class of animal having its own specific heat, and which is essential to the maintenance of its vital actions; and perhaps, too, in this class of animals, as a less stimulus of temperature is necessary to muscular action, so may be a less degree of nervous or electrical excitement.

3rd. Dr. Philip subsequently proved, that the action both of the heart and capillaries is to be influenced through the medium of the brain and spinal marrow; for instance, "alcohol applied either to the brain or spinal marrow, accelerates their action, and tobacco debilitates them." I shall not adduce any experiments in proof of these points, as there can be no difficulty in conceiving this to be the case, when we reflect upon the formation of the sympathetic nerve, from twigs holding communication with these organs, as well as the connexion maintained between them, through the medium of the eighth pair; and the same may be said of the peristaltic motion of the stomach and intestines, which he proved also "to be independent in their action of the brain and spinal marrow, but, like the heart, to be influenced through the medium of these organs."

The following experiments of Dr. Philip favour the opinion, that electricity is the cause of nervous excitement, and that the brain is its receptacle. By dividing both of the eighth pair of nerves which descend from the brain, and thus cutting off the supply of electricity, the secretive and digestive processes of the stomach were arrested; but these processes he completely restored, by furnishing the stomach with a supply of the galvanic fluid along the divided nerves. Further he proved, that "the secreting power of the stomach is almost as much deranged by destroying a considerable part of the spinal marrow, as by dividing the eighth pair of nerves." This is another strong argument in favour of my views: it does so, by depriving the organ of that quantity of electricity which would otherwise be transmitted from the brain, and obtained through the medium of the spinal marrow from the collecting nerves; in short, depriving the brain of its principal source of supply. The functions of the involuntary muscles, it will be remembered, as proved by a former experiment, in this case are not affected, as they derive their excitement from the sympathetic, which still holds its connexion with the collecting nerves; this tends to corroborate my opinion as to the origin and office of the sympathetic, as well as of the function of the collecting nerves.

Dr. Philip goes on to observe, as legitimate deductions from his numerous experiments, that the ganglions (meaning those of the sympathetic) are a secondary centre

of nervous influence, whose nerves are as extensively distributed as those which proceed from the brain and spinal marrow; that the ganglions are the means by which the influence of these organs is bestowed on the parts which we have found influenced by every part of these organs, viz., the organs independent of volition; in all which I fully agree with Dr. Philip, excepting the ganglions' generation of this principle, which I believe he means to imply.

Dr. Philip further observes, that "the excitement of the organs of involuntary motion in all their usual functions, appears to be rendered independent of the nervous influence" (of course he here means that imparted by the brain and spinal marrow), "because their functions require a more uniform excitement than could have been derived from this source." Let me remark, how well does my explanation provide these organs with an equal and constant supply, rendering these, too, the first to receive electrical excitement, and the last to lose it, as long as it is generated in all and every part of the capillary system.

Dr. Philip adds, "We have reason to believe the nervous influence is the galvanic fluid, collected by the brain and spinal marrow, and sent along the nerves; it being not only of all artificial means of exciting the muscles that which seems best adapted to the purpose, but capable both of forming the secreted fluids, and causing an evolution of caloric from the blood, after the nervous influence is withdrawn."

"The nervous power is not more distinct from the muscular than it is from the sensorial power, as we find the first capable of all its functions after the last is withdrawn."

"The only function essential to animal life, in which the sensorial power is concerned, is respiration; and consequently it is by the interruption of this function (that is, the excitement imparted through the medium of the respiratory nerves and eighth pair), that the removal of the sensorial power proves fatal, except where the sensorium is so impressed as immediately to destroy all the functions," which was the case, when Dr. Philip suddenly smashed the whole of the brain of a rabbit, and which, probably, by withdrawing or annihilating the fund which is immediately essential to the continuance of the respiratory and vital functions, is analogous in effect to a stroke of lightning; the latter operating, I presume, in the following way:—this larger charge of electricity being positive to the body's small quantity, and relative negative state, completely annihilates it, to the extinction of all the functions; hence it is, that from the cessation of the capillary circulation, the muscles in such cases are found to have immediately lost their irritability, and

that blood is discovered in the arterial, as well as in the venous system. "The sensorial power appears to be the last which is produced, and the first whose operation ceases." This becomes a necessary deduction from my argument, of its source being in the organic capillary system.

I shall conclude the subject by offering a few remarks on the functions of the brain. As a whole, I am of opinion it may be considered as the receptaculum commune of the electric or nervous fluid, which it receives through the medium, principally, of the spinal marrow, from the numerous collecting nerves of the body. An objection may be urged against the brain's having the power to retain so unconfinable an agent as electricity; this objection, however, cannot apply farther than in relation to other parts of the system. Now the conducting and comparatively retaining power of substances out of the body are manifold; and as the nerves, I believe, have been found to be the best conductors amongst the textures constituting the animal fabric; and as the medullary fibre of the brain is of the same nervous character, there can be no difficulty in conceiving the thing. Consider, also, the membranes in which it is enveloped, and that the dura-mater forms a sheath to the spinal canal, and to every nerve proceeding therefrom; may it not insulate these fibres from adjacent connexions; and does not this opinion receive support from the fact, that no nerves have yet been traced to enter into the composition of its texture, so different in this respect from all others? No doubt the air and surrounding media gradually abstract it from us, and that it escapes from the system in conjunction with the perspirable and other secretions; hence when any of the more important secretions are suppressed, there is so much irritation and restlessness experienced. Let it be also observed, that it is only for a temporary purpose I suppose it possesses this power of retention, not supposing there is at any time a large accumulation, for the demands on the fund are so manifold, particularly in the excitement of the respiratory muscles, and the secretive and digestive processes,*

* I would almost venture the opinion that there is a regular circulation of the electric fluid in the animal system, analogous to the circulation of the blood. Electricity being evolved in the capillary system during the conversion of arterial into venous blood, and proceeding along the collective fibres of the nerves, it communicates in its passage to the spinal marrow and brain, what is required to the twigs given off and forming the roots of the sympathetic, for the excitement of the vessels of circulation and involuntary organs, or vital functions; the surplus proceeding along the spinal marrow, communicates, during the period of being awake, excitement through the medium of the med. oblong. to both cerebrum and cerebellum, or sensorium, in all its functions, mental as well as animal; and thence proceeding is transmitted by the pneumo-gastric and

which are constantly in action, that the expenditure, I conceive, at most times equals the supply. Its being otherwise probably may be the cause in some cases of madness, the mental organ being in consequence over-excited; hence it is that examination of the brain in such cases after death so frequently presents no lesion of structure. Or where the stomach is kept in a state of constant excitement by full diet and tit-bits, that the mental organ is not duly excited, making good the passage in Shakspeare, that,

"Fat paunches have lean pates;
While dainty bits make rich the ribs,
They banter out the wits."

And that idiotism may be dependent on some defect in the communication of excitement, to the intellectual portion of this organ; and cretinism to the same, though secondarily induced, as a consequence of defective supply, resulting from the respiration of malaria, or a very rare and attenuated atmosphere.

The brain also, in a restricted sense of the word, I concur in considering with Gall and Spurzheim, as the organ of the mind; but I am not prepared to say any-thing of their division of it into parts as numerous as there are faculties. But speaking of the brain in the aggregate, that is of the whole substance within the cranium, I would assign to different portions different purposes. The cerebrum surmounting the medulla oblongata consists of numerous convolutions united to the central fibrous medullary structure, in a manner analogous to the intestines on the periphery of the me-

respiratory nerves for the excitement of the respiratory and assimilating processes; in the latter instance, re-entering into combination with the alimentary material, it is re-evolved in the nutritive and formative functions of the capillary system. Digestion, I presume, therefore, to be effected in the following way. Electricity being transmitted to the stomach by the par vagum, not only acts upon, but I believe enters into combination with the alimentary material, and thus is its digestion and animalization effected. This appears to me a much more reasonable explanation of the process of digestion than the opinion generally entertained of its being simply the effect of the solvent and assimilating qualities of the gastric secretion; which I believe to have been found to have but little effect in accomplishing such active solvent purposes out of the system. Whereas, the experiments of Dr. Philip unequivocally prove that galvanism, however it may operate, is capable of effecting digestion, or that something of the kind is indispensable to the process. The opinion generally entertained on this head is, that it accomplishes digestion by the secretion it gives rise to; whereas I am of opinion this is but a concomitant circumstance, possibly, however, aiding the process by permeating and softening the textures of some substances, and dissolving others; the essential agent being the electricity itself. From the muculent and apparently inert character of the gastric secretion, it may be inferred, if my explanation be admitted, that it serves little other purpose than protecting the coats of the stomach from injury in the process, or none beyond what has been mentioned.

sentery, and is the organ (speaking of it as a whole) the functions of which are intellectual. The medulla oblongata, meaning thereby all the inferior part of the cerebrum, and from which the nerves of sense arise, is the organ appropriated to receive the impressions of the senses, and which it communicates to the mind by the blending of its nervous fibres with those of the cerebral organ, in the medullary portion of the latter. It is very clear that the senses are united in function, as they are only thus conjointly under the power of volition. As a proof, I cannot will to see, without both hearing and smelling; nor have I the power to arrest the function of either singly, but the whole I can, simultaneously, by going to sleep; and thus it is that the muscular nerves of the organs of sense arise also from the medulla, as they are united in effect; and hence also it is that the medulla oblongata is formed by the crura cerebri et cerebelli, or at least that they enter very largely into its composition, thus blending the animal functions, or voluntary, with the mental in this organ, as it is conducive to the functions of both, and they are conjointly in operation.

The state of being awake, or alive to all the impressions of sense, I am of opinion, is that in which the current of electricity passes through, or is extended to the medulla oblongata, and thus are the senses and all the functions in a state of excitement; whereas in sleep, the stream of electricity takes a different course, or perhaps wholly passes off by the pneumo-gastric and respiratory nerves, which, it will be remembered, arise from the inferior part of the medulla; or perhaps I might more properly say, the summit of the spinal marrow; hence it is, that digestion and the secretive processes are much more active during the state of sleep; and that dreams, we may infer, are occasioned by the excitement of the intellectual organ, the before-mentioned nerves not withdrawing a quantity of electricity equal to the supply; and thus it is also difficult to sleep with an empty stomach, and, the reverse of this, how great the propensity to sleep after a full meal. Finally, the spinal marrow, appended to and surmounted by the cerebellum, are organs appropriated to volition, and the numerous functions more particularly characterising animal existence; to the excitement of which, accompanied with that of the cerebral organ, during sleep, or unaccompanied with the excitement of the medulla oblongata, may somnambulism be attributed.

In conclusion, it may be observed, that the scale of animal life comprises three conditions of existence. First, the organic, or that going on in the capillary system, or structure analogous; this bordering on vege-

table life; and the latter on chemical affinity, rendering the last the bond of union between organic and inanimate nature. Secondly, the nervous and sentient, dependent on the first, or the more particularly animal; connected with organs of sense and volition. The third and last, surmounting the whole,—the intellectual; on the summit of which man stands proudly pre-eminent, with a brain or cerebral organ developed in a ratio with his vast comprehension and superiority of mind above the rest of the creation; and holding communion with an immortal spirit, in a way inconceivable to the limited number of faculties with which it has been the pleasure of the Almighty to endow him.

THE LANCET.

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ATROCIOUS as is the conduct of the self-perpetuating Council in Lincoln's Inn Fields in applying to the Court of King's Bench for a criminal information against certain members of the College,—obvious as is this atrocity to every rational being, indignant as must be the whole profession at such an act of unparalleled tyranny and injustice, still we should forget much of what is due to this body, we should be regardless of the weight of dishonour consequent upon their proceedings, were we to be unmindful of the cause—of the only cause which elicited their revengeful and implacable ire on the late occasion. What was that cause? What was that great and stirring circumstance which so violently agitated the bosoms of the manly and intrepid self-perpetuating “twenty-one?” Upon this point we should dwell with the most scrupulous pertinacity, not only with a view to render justice to those members of the College who exerted themselves on behalf of the naval surgeons, but in order to enable the public to appreciate the motives which induced the Council to attempt to exhibit four of the members of the Commonalty in an English court of law, as “rioters,” and “conspirators.” In investigations of this