

Observations on life as the cause of the vital phenomena.

Contributors

Royal College of Surgeons of England

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OBSERVATIONS ON LIFE

AS THE

CAUSE OF THE VITAL PHENOMENA.

Heaven

Es ist der geist der sich den körper baut.—SCHILLER.



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P R E F A C E.

THE writer of this paper has not now any right to consider himself as belonging to the medical profession, and, therefore, it is less likely that the present announcement is made merely for the attainment of some selfish end. For many years past the greater part of his time has been chiefly devoted to the active pursuits of agricultural life, and in all probability such will be his chief occupation for the rest of his existence in this world. In the midst of many interruptions, he has silently, and without assistance, devoted some attention to the subject of the present inquiry, and for a reason to be referred to hereafter, he now makes the present announcement. He is aware that the public will ultimately judge of the accuracy of his views from the strength of his facts, and as his name is too humble to add to the force of these facts,

Stet nominis umbra.

LONDON,
1st June, 1842.

OBITUARY

The death of Mr. [Name] is reported in the [Newspaper] of the [Date] and [Location]. He was born [Date] and died [Date]. He was a [Profession] and a [Religion]. He was [Age] years old. He was [Marital Status] and [Children]. He was [Education]. He was [Military Service]. He was [Awards]. He was [Other Information].

OBSERVATIONS,

&c.

THE result of some experiments which the writer made many years ago, led him to an inquiry into the cause of muscular action; and after having made many additional experiments, but especially after some reflection on the vital phenomena as presented in the various grades of animated beings, he believes that the following inferences may now be considered as physiological facts.

First, That there are a thousand things done in the body that cannot possibly be done by the mind, or by any other agent that resides in the brain. There must, therefore, be some other cause to produce these effects, otherwise the body could not be organized, neither could a single movement be made in the animal frame.

Second, That there is in the living body, independently of the mind, an internal vital agent, which is endowed with an innate power of action, and that this vital agent, or, in other words, LIFE, is the direct cause of every movement, both voluntary and involuntary, that is made in the living body.

Third, That in man, and all the higher order of animals, the great solar ganglion is the seat of life, and the gan-

glionic nerves, which have their insertion in and derive their origin from this central organ, are the nervous machinery with which it works. The principle of action which resides in the solar ganglion has many motor nerves at its command, with which it performs its own voluntary movements ; but the great sympathetic nerves, or the internal spinal cords, are the true motor tracts.

If the above inferences be correct, it will not be denied that they are most important. Some of these views are not in accord with common opinion, but all of the above inductions have been well weighed before they were made. The present paper is, as we have said, a mere announcement, but our inferences are founded on facts, and we possess strong evidence to prove the accuracy of every assertion that we make in this paper.

We cannot always depend on the experiments that are made on cold-blooded creatures, particularly when the conclusions from them are drawn by physiologists who are not thoroughly acquainted with the structure and functions of their nervous systems. In some respects there is no analogy between warm and cold blooded animals. Their structure is not the same, and in many respects their functions are different; consequently, inferences drawn from the latter are often fallacious when applied to the former; and when we reason on the vital phenomena in the higher animals, even one accidental experiment made on the living body of a human being may be worth a thousand experiments on those cold-blooded creatures that are so tenacious of life; or, in other words, their fibres are so imbued with vitality, that these animals may be cut and maimed in every direction, and still their fibres will re-act

on the application even of the stimulus of the atmospheric air. Experiments on the lower animals that have warm blood are sometimes of great value, but they are not always necessary, for in many cases, truth can be established by reasoning on the visible vital phenomena, with as much certainty as it could be by all the experiments that can possibly be devised.

As the mind is not endowed with any innate knowledge of the organized structures, it is very evident that it cannot be the direct cause of any of the muscular movements that are made in the living body. When the mind wills a movement to be made, it may give the stimulus of volition, and the movement is instantly made in obedience to the will. But the movement is not made by the mind, for it can only will, it cannot act, or regulate the actions of the muscular fibres. In the involuntary movements it is very clear that the mind cannot be the motor power, and we may rest assured that there is only one principle of action in the animal frame. Even the voluntary actions cannot be made by the mind, for the mind of itself can no more select the proper nerves, or move a muscle, than it can move a mountain.

The muscular fibres are endowed with sensibility, or, in other words, with vitality; and this vital property enables the fibres to feel the impressions that are made upon them by the vital agent. This agent is endowed with innate intelligence. It is this innate power that enables it to select the nerves and to give the motor impulse, but the vital power does not reside either in the brain or in the spinal marrow. There may be two nerves, with distinct powers, in one sheath; but we believe that there is not one nerve in the whole body that has either an excito-motory power, or a reflex function. The spinal

cord is a mere appendix to the brain ; its composition is the same, and if the vital agent does not reside in the cerebrum, or the cerebellum, it can scarcely have its seat in the spinal cord.

If the motor power, or, in other words, life, resides in the spinal marrow, where does the vital agent reside, and what is the cause of action in those anencephalous fœtuses that are born without either a brain or a spinal cord ? The spinal cord exists only in the vertebrata, and if this cord be the seat of life, where does it reside in those myriads of animals that have no spinal cord ? In the whole of these animals there is but one great ganglion, as a residence for the vital agent and ganglionic plexuses and nerves, with which the principle of action performs every movement that is made in the animal frame.

The vital agent is endowed not only with vital sensation, but with an innate power of action. It is this innate power that enables the vital agent to assimilate inanimate matter to itself, with which it organizes a body for its own residence. It is this innate power that enables the somnambulist not only to walk, but to walk in safety, to carry on conversations, and even to make the most difficult calculations, when the mind is asleep. It is this innate or instinctive power that enables the vital agent to produce all the involuntary actions, without any assistance from either the brain or the spinal marrow. It is this innate or instinctive power which enables the living principle, not only to select the nerves, but to give the necessary impulse, and to act *suâ sponte* in the living body.

Those writers evidently wander from the truth who place the soul, or the principle of action, in either the brain or the spinal cord, for the brain may be removed without the loss of either life or muscular action. And if there be

any principle of action in the spinal marrow, it is not a mental but a vital power which acts in the living body under the direction, not of the brain, but the vital agent.

The muscular fibres are exquisitely imbued with sensibility ; and this vital property enables them to feel, but not to act of their own accord. The application of a stimulus produces contraction in the fibres, and if a strong stimulus be applied, it produces pain in the part, and the sensation of the pain is conveyed to the brain by the sensiferous nerves, with all the celerity of thought. When these sensations are conveyed to the brain, the mind may will consequent movements to be made ; but as these movements are not made by the sensiferous nerves, there is, in this instance, no reflex action. When we divide the spinal cord in any cold-blooded creature, the sensations of injuries done to the lower extremities cannot be directly conveyed to the brain. But as the lower part of the cord is still endowed with vitality, this vital property enables it to feel the sensations. These sensations may act as a stimulus to the roots of the still vital motor nerves, and contractions may be produced in the lower extremities. But as these movements are not made by the same nerves that convey the sensations, they are not more reflex actions than when the same movements are made in obedience to the will of the mind. In the latter case, they are well regulated actions made by the vital agent, for the attainment of its own ends ; but in the former case, they are mere automatic movements, made through the spinal cord, not by the cord itself, but by the mechanical stimulus that causes the contraction. When the head of an animal is cut off, the movements are made not by the cord, but by the vital agent.

The presence of a spinal cord is not at all necessary to the production of these automatic movements. We have seen the heart of a warm-blooded animal contract regularly and distinctly, for seven hours after the whole of the brain, the medulla oblongata, and every inch of the spinal cord had been thrown in the fire and reduced to ashes. The muscular fibres may be forced to contract even after a limb is removed from the body, consequently these movements cannot be the effect of any cause which has its residence in the spinal marrow; and afterwards we shall bring forward the most unequivocal evidence to prove that not only in some lower animals, but even in the human subject, sensation, and the power of motion, may continue in the lower extremities even when the spinal cord has been completely severed in its centre. In these cases it is very clear that the muscles in the lower extremities could only be made to obey the will of the mind by some vital power in the ganglionic system.

The sympathetic plexuses receive their motor nerves from the solar ganglion, and within an inch of the spinal cord there is a double connection betwixt each of the sympathetic plexuses and every one of the spinal nerves. This is no accidental connection, for it exists in every instance. The one of these two branches is evidently a vital sensiferous nerve, conveying intelligence from the body to the vital agent in the solar ganglion, and the other branch, which runs from the solar ganglion to the plexus, and from the plexus into the spinal cord, is the medium by which the motor power is given by the vital agent to the roots of the cerebro-spinal nerve, with which it is connected. Even every one of the motor nerves that originate in the brain has a similar double

connection with the cerebral plexuses of the great sympathetic nerve.

The spinal accessory nerve derives its origin, not from the spinal cord, but from the upper part of the semilunar ganglion ; it enters the medulla oblongata with the par vagum, is distributed on the roots of the phrenic nerve, and keeps up the respiratory movements when the mind is asleep. The par vagum also derives its origin from the upper part of the semilunar ganglion, enters the medulla oblongata, and terminates in the retiform body, where it has a direct communication with both the cerebrum and cerebellum. The par vagum regulates the play of the mental nerves in the upper part of the cord, and is in reality the cord of communication betwixt the vital power and the mind.

We consider the solar as the only true ganglion. It is not a mere protuberance of the sympathetic nerve, but a central organ, with a considerable quantity of neurine in its centre. The plexuses are, generally speaking, mere nervous interlacements. These plexuses may have an independent power of action ; but in the living body they all act under the direction of the vital agent, which is, in truth, the sole governing power in the animal frame. The solar ganglion is placed in the very centre and most secure part of the body, where it has a direct connection with every part of the animal frame. In every animated being organization begins in the centre and works outwards. Human fœtuses have often been born alive without either a brain or spinal cord, but no human fœtus has ever yet been born without a solar ganglion or ganglionic nerves. We may add that in the higher animals, irritation of the solar ganglion produces an universal trembling, a greater degree of

irritation causes convulsions in the whole frame, whilst even a moderate degree of pressure on the central ganglion is instantly fatal to the existence of life.

The cerebrum is the seat of the mind, but neither the cerebrum nor the mind is essential to the continuation of the vital phenomena. We may remove every bit of the cerebrum, and even the cerebellum, from any animal, but still it does not die. The spinal cord is the tract of sensation and mental volition; but even this tract is not essential to the continuation of life. We may remove every particle of the spinal cord; but still even this does not cause death, so long as we do not interfere with the insertion of the par vagum and the spinal accessory nerves. When we divide these vital nerves, after their insertion into the medulla oblongata, we not only suddenly cut off the communication betwixt life and the mind, but we destroy also the power of involuntary respiration, the cord loses its tension, and from these causes as well as the shock which is given to life by the sudden destruction of the medulla oblongata, this experiment is, in most cases, but not always, instantly fatal to the vital power, and not only respiration, but all the phenomena of life immediately cease.*

* In a note lately published in *The Lancet*, Dr. M. Hall attributes the respiratory movements, when the cerebrum and cerebellum are removed, in mammalia, principally to the reflex action of the pneumogastric nerves. This is evidently an error, for, as the pneumogastric has neither its origin nor termination in, or any connection with, either the diaphragm or the intercostal muscles, it cannot possibly, under any circumstances, be the direct cause of the respiratory movements. In the bird tribe, the vital impulse which causes the respiratory movements is given to the cerebro-spinal nerves, not in the medulla oblongata, but in the dorsal part of the spine. It is for this reason that a bird can live after its head is completely cut off; or, in other words, an animal can not only live, but breathe and run, after the medulla oblongata, "the key-stone of the reflex arcs," is completely removed and thrown in the

Life has its faculties as well as the mind, and the mind is but one of the many faculties of the internal vital agent. The mind is only a part; life, or the vital entity, is the whole. It is the mind that enables the vital entity to keep up a connection with the external world. It is the mind to which the vital agent is indebted for all its acquired knowledge. Selective absorption, digestion, circulation, assimilation, organization, respiration, secretion, reparation, and reproduction, are all vital properties. Sensibility is common to both the vital and mental powers—but even this is decidedly a vital property. Consciousness, memory, thought, reason, judgment, and volition. It is not, therefore, the pneumogastric, but the great sympathetic and the spinal accessory that enable a bird to live, to breathe, to run, or even to fly, after its head is removed from the body.

All this is very different in dogs, rabbits, cats, &c. Volition is the stimulus to the voluntary movements, and without this the sympathetic nerve does not generally act. When in these animals we leave the brain untouched, and divide the par vagum, respiration is kept up by the sympathetic nerves, and life continues, at least for a time. But when we first remove the cerebral lobes, and then divide the par vagum and the spinal accessory nerve (which are both in one sheath), we cut off the vital impulse that is given by the vital agent to the medulla oblongata, and the upper part of the spinal cord. Under these circumstances, the medulla oblongata can do nothing of itself, neither can the spinal cord or the spinal nerves; consequently, when this experiment is made in these animals, it is almost instantly fatal. A few attempts at respiratory movements may still be made by the vital agent, through the medium of the sympathetic nerve; but now, when volition is removed, they are not successful. In this experiment the medulla oblongata, the spinal cord, and the phrenic nerve, are all untouched; but still the animal almost instantly dies. Now, if the medulla oblongata, or the spinal cord, has any inherent power, or if either be the seat of the principle of action, why is it, that under these circumstances, neither the one nor both of them can continue the respiratory movements? The cerebrum may be removed, and if the vital nerves be left untouched, life is continued. The respiratory movements are still kept up by the vital agent; but if we cut its nerves, the poor animal may struggle for a moment, but it must die. From these facts alone, it is very clear that life, or the principle of action, resides in the ganglionic system, and not in either the medulla oblongata or the spinal cord.

lition, are mental powers, but these powers are merely superadded to life. In one word, the mind in man is the mind of the soul.

In all those animals whose movements are rapid, the vital agent requires an organ for its own residence and nerves to act with as well as the mind. As the mind is dependent on structure, it requires a large organ to do all that is done in it; but as the vital agent is not the effect but the cause of structure, a small organ is all that is necessary for its residence, and the more delicate structure of the ganglionic, or vital nerves, with which it works, is of itself a sufficient proof that they belong to the nobler organ, which is, as we believe, the seat of life not only in man, but in all the higher animals.

It is well for us that we have in the body an internal agent endowed with powers that are infinitely superior to the acquired knowledge of the mind. We are, for example, often placed in circumstances of great danger, when a doubt, or even a moment's hesitation, would be instantly fatal. In such cases, if we depended on the tardy operations of the mind, even in one moment all would be lost. But besides this, when the mind is fatigued it requires rest; and were there not some other agent in the body besides the mind, not only the whole of the human race, but every animal that has warm blood, would cease to exist in less than five minutes from the time that the mind goes to sleep. Lord Bacon says, that "solids are stupid things," and he says so with truth, for, as we shall afterwards prove, it is the invisible vital agent that does all that is done in the animal frame.

" And reason raise o'er instinct as you can,
In this 'tis God directs, in that 'tis man."

We may add, that a nervous system is not essential to the existence of life, for it exists in every animated agent, from the plant that produces the smallest blade of grass, to the human being who is made after the image of God. In the vegetable kingdom, life has its residence in what is commonly called the heart of the plant. In the inferior orders of animals, life evidently resides in the ganglionic system.

After what we call death, the material ingredients of the body may lose their vitality, and ultimately be reduced to their original elements; or as the mind is only a faculty dependent on structure, it cannot, after death, exist as a distinct entity. But as "the ray of the Divinity that stirs within us" is not the effect but the cause of structure, and as this vital agent never sleeps even for one moment during its residence in this world, we may reasonably hope that the soul of man will not perish.

We say, emphatically, the soul of man, because in the human race the vital agent is not only a direct emanation from the Deity, but it is endowed with powers, superadded to life, that make the human soul as infinitely superior to the vital agents of even the highest orders in the animal creation, as the rays of God's blessed sun are superior to the feeble twinkling of a midnight lamp. This is not a mere difference in degree, but a superaddition of the highest powers. It is these very powers that distinguish the human race from the brutes that perish. It is these very powers that make man a free agent, and render him responsible not only to the laws of his fellow-creatures in this world, but to the tribunal of his God in the world to come.

We must beg leave to entreat that our readers will not come to any hasty decision concerning what we have said with respect to the structure and functions of the ganglionic system until they have previously examined minutely the structure and connections of the great solar or semilunar ganglion, as well as the plexuses and nerves connected with it, either in the dead body, or in Mr. Swan's splendid and faithful plates of the nervous system. The meritorious author of that work is personally unknown to us, and as his work was published in 1830, these plates could not have been made to accommodate any facts that we may now bring forward in 1842. The reader, however, is requested only to look at the faithful representation of nature as exhibited in these plates; for if our views be correct, he will be led into error by Mr. Swan's descriptions of the origin and uses of many of the great ganglionic nerves, which he has described according to the notions which then prevailed on this subject.

The writer of this notice has a work on Life nearly ready for the press; but as he is obliged to abandon the inquiry, at least for the present, he has made the present observations in the hope that they may attract the attention of other physiologists to the same subject.

At present we see only the two ends of a chain, the centre of which is completely concealed from our view; but the connection between them is as certain as it is invisible. By-and-by, all the rubbish may be removed, and the whole chain may then be made perfectly visible, even to the limited faculties of the human mind.