

Lect: LV. Feb. 6<sup>th</sup>) J. B. Broome

On this subject we ought to put every question whether it can be answered or not; and we should also say how far each one can be answered. —

The laws by which motion is excited in the nervous system. In the last lecture I mentioned four circumstances, with regard to impressions, I said the first, were purely mechanical, secondly, those accompanied with a sense of propensity to motion, but without propensity to particular motions: Thirdly, those attended with a sense of propensity and determination to motion, without any view to the end or purpose; & fourthly, those in which there is a propensity w<sup>th</sup> a view to the end to be thus obtained; It is the last set that are called most commonly voluntary. We will the end and effect: But it is agreed that we do not will all the means by which it is produced, such as the contraction of the several muscles.

Further we do not properly will even the motions of our <sup>whole</sup> body or particular parts, which are necessary to the effect of the will. In throwing a stone

2 I lift up my right arm & set back my right foot, and then bring my arm forward. now in this action I exert ~~an~~ variety of muscles without being either conscious of it or, the particular motions I use in the action. When a child first attempts to throw a stone, he does it awkwardly, but acquires more skill at every effort. Now nobody will say that they have sense of motions to perform the actions more skillfully. Therefore the last of the four sets of impressions, and the rest are merely shades of the same colour. A still further illustration is to observe that the most of our actions are in consequence of imitation. In our imitations we have no more than the sense of willing imitations. There is a connection between the disposition to imitate & the motion. The volition may be the cause of the effect, but does not direct it. I will to sing a song which, in my particular case is a very ineffectual volition. A man in that case that he move

Take view then of volition in conducting motions. Some have talked of volition directing these motions and with a view to an end; I allow the view to the end but no more. If some of our actions be at ~~all~~ times without perception & these

without volition, you will perceive how far this opinion is wrong. This is the Italian Doctrine. I am not disposed to take much pains about it, or to go into a long discussion of it; my prejudices are for the Italian Doctrine but my reason is against it. I will give the considerations that determine me on this subject. First, to will properly is truly in directing the actions of the body. Secondly our views of ends and purposes are all determined by motions arising ultimately from impressions. And our perceptions are in proportion to impression and sensibility taken together. These are the foundations of all our judgements of the operations of medicines. When I gave a vomit I proportion my dose in bulk to a general rule; but upon experience I find that the person had more or less sensibility which therefore altered my rule. I find also that certain circumstances in the body increase sensibility in which case the dose must be less; and when I find a larger, or the usual dose did not produce the effect, I perceive it is owing to a quantity of mucus in the stomach. If the stomach in the beginning of a fever will hardly bear fifty of Castoreum, & that in the advanced state it will scarcely be moved by ʒss. I find that theba-

4. Tendency to vomit adjusts the operation of the medicines, but the comatose disposition so usual in the end of fevers counteracts it. In the case of Diarrhoea we see that ~~in proportion~~ what is thrown out is merely in proportion to its mischievous effects; and that what we do and what we do not is directed. In the human body there is a constitution whereby the several impressions that produce diseases, at the same time excite such motions as counteract the effects of the disease, but we cannot see that it is with any perception of the end. Nature directs the means for the <sup>an</sup> expulsion of the extraneous Body, brings on inflammation, pours out serum; It is the nature of our serum to change into pus and to undergo putrefaction, to destroy the cellular substance; and make an aperture by which the extraneous Body is thrown out. But does nature constantly adapt this effort to the mischief of the extraneous Body; and direct it in proportion to the salutary end. That blood from the same putrefaction and same heat, produces, in some cases, a poison instead of caudable pus. Now this is gangrene which I would not impute to the soul mistaking the matter, but to the state of organization, & of the nervous Power. Tho' there is a

sentient principle in the soul yet that is invariably connected with the organization of the Body, and the chemical conformation of it. This sentient principle may have a share in the operation and I take it to be a *sine qua non*; But still it must be determined by the mechanism of the Body. "et causa motum excitans in stimulo. causa efficiens in animo sit." and in N. 40 of D. White. "Nor can we" says he "consider the mind as acting ignorantly or perversely."

action". And he might have added that action is the immediate consequence of the nature of the stimulus. I conclude by pointing out what ought to be our conduct in philosophising on the animal Body. We should begin with every phenomenon of the animal Body, so far it can be accounted for by the Laws of mechanism or Chemistry, how far it is reducible to the general Laws of motion in other Bodies. Secondly, we may examine the operation of a cause independent of perception. and thirdly when perception appears, we should consider the effect according to the steady Law, whereby sensibility and imperfection together

6<sup>th</sup> their Determinate perception. If we resolve any of these into the arbitrary motions of the soul, we speak unintelligible jargon. By what laws is the action of the nervous power excited? The first is very general, it is the effect of the repetition of the same action, the first effect of which is greater facility or greater strength. Every muscle becomes stronger, and the man who continues to lift a ball till it is grown up will at last be able to lift the ball. In some measure it depends upon strengthening the fibres; but it depends more upon the nervous power being determined more freely and more copiously into the muscles. I think this is evident from the effect of Electricity in curing paralytic muscles, where it not only restores the fibres of the muscle, but also the power of the will, and therefore it restores the communication between the sensorium commune and muscles. We have reason to believe that one of the causes of life mobility or of no mobility at all is stagnation, and mobility may be increased exactly like the elasticity of elastic bodies which is acquired by repeated motion. The cause of stiffness or rigidity abridges all first trials of motions, but repetition gives

us agility in the same motions afterwards. I need give no more instances, but shall proceed to an illustration of a different kind; we have this proof of facility, that the motion can be renewed by weaker impressions than were at first necessary. A man takes a dose of emetic and repeats it several times. The first effect of repetition is that the dose must be increased as the repetition goes on. We said that the force of repetition is constantly becoming weaker & weaker. But if this repetition goes on for a greater length of time it seems to procure a facility of motion in the nerve of the stomach, and now a much less dose than before will produce vomiting. It may be in some measure thus explained. They will take place sooner or later according to different circumstances of sensibility or mobility, and according as the person is disposed to be affected by one law or the other. Now if that is the case while the repetition has not been able to



8 take place, so far the law of sensibility will take place. But Habit is much more powerful in the last case that our motions will become easily renewed, from the mobility being increased. All habitual motions are thus easily renewed.

Lect. LVI. Feb. 9. 1780.

I said that every action, by frequent repetition, becomes more easy and is performed with more strength. If we suppose the nervous power is confined to the nerves by the surrounding parts, we can easily see that these may resist the nervous power, according to their greater or lesser degree of extensibility. But by frequent motions the nervous power will be accumulated and hence easier of motion. It appears that in consequence of this faculty, a smaller impression will be sufficient than that which produced the same action at first. It may then, be varied considerably by taking off the resistance. <sup>And</sup> I can suppose that irrita-

bility and sensibility are not properly and strictly connected together. The explanation of irritability which I reserved for this place is this. Dr. Haller & others who mention a power of contractility residing in the muscles, make it a condition of the vis insita, but we have refused the vis insita and therefore the opinion of irritability depending on it. Others who refuse the vis insita of Haller use the term irritability. Gaubius has used it and advanced a proposition which most Physiologists, who refuse the vis insita have ran into. If there are impressions attended with perception that do not evidently to us produce contraction, only give perception, to these the term sensibility may be confined, and the term irritability may be applied where contraction is produced. Dr. Gaubius, defines irritability "ut levibus stimulus in motus accumpat in crines". But sensibility and

10 irritability are totally distinct. I think the supposition of a peculiar organization that sets the fibres to be acted upon by the nervous power, flowing into it with greater force is admissible, and this organization may vary in its circumstances, and may be more or less fit for receiving the nervous power; and this fitness I call irritability. Further there may be a difference in the nervous power. My conception is, first that the nervous power is confined to the nerves, to the muscular fibre by the vis mortua of your will, of the surrounding membranes. I can conceive that upon repeated impulses the degree of extension of these may be considerably varied. And the freedom of motions, if it be less proper to call it mobility may be considerably varied. I consider irritability as in the nerve and proper organs of

motion, and both more or less fit to produce contraction, as the last are more or less fit to receive the influx of the former into them; and accordingly a force vastly less may in certain circumstances produce these motions.

We can easily hence understand the proposition of the moralists, that habit improves our active while it diminishes our passive powers, improves our irritability while it diminishes our sensibility.

#### Other Laws of Habit.

Next actions may be associated with impressions, that are not otherwise naturally stimulating. Thus the natural stimuli to the contraction of the bladder of urine, is either its fullness or some stimulus within it. Now to render this action every other circumstance that happens to be associated with it at the same time is often requisite. Thus people who make water before they go to bed will naturally take

12 up the chamberpot and set about it when he is naked before the bed; and when a man has indulged too freely in strong liquors and is put to bed sooner than ~~usual~~ common, he will naturally arise at the accustomed time to do the office. Most of our actions then may be associated with impressions that do not naturally prove a stimulus, but which ever after renew the volition. Thirdly actions are associated with actions without any final purpose, and too frequently repeated together, come to be almost inseparably connected; hence the uniform motion of both eyes. Fourthly actions frequently repeated with a determined force and celerity can only be renewed with the same degree of force at least very nearly. Hence the connection of every workman with his particular utensil; and a man will goe for a great length of time with his own pace who will not advance

at all if hurried. Fifthly associated actions are repeated only in the order in which they have been habituated. In the memory <sup>when</sup> we want to recall certain verses of a Poem, if we catch the first word the rest follow spontaneously. This is the foundation of the ordinary train of thinking. Sixthly in consequence of these actions periodically repeated, after such repetition for a certain number of times, they become spontaneously periodical. In the instance of the Stafford Idiot who was used to repeat after the clock thro' all the hours; this came to be so strong a habit that when the clock was out of order the Idiot served instead of it. This appears a very mysterious, but it is a simple law of the animal Economy; admitting a certain order, nothing is more easy than to exhibit order, if the repetition be strong enough. I conclude by saying that if any of you don't perceive the use of marking these

145 Laws of habit, please to attend that every observer has remarked, that the oeconomy of man either physical or moral is made up of habit. I imagine that it is not strictly connected with the animal oeconomy but that it is in the vegetable also; In supporting our virtue and guiding our prudence we may depend upon it in great measure, but habit may be equally prejudicial to both.

Other general laws of the nervous system. And first some circumstances relative to contraction are to be taken notice of. Contractions is naturally succeeded by relaxation. Thus the effect of stimulus produces contraction, yet when continued it alternately produces contraction and relaxation. A part of the illustration of the same is that when the stimulus is removed, the alternate contractions and relaxations continue to be renewed for some time when relaxation should

take place. If the nervous fluid is elastic, if it is accumulated in a muscle, by the elasticity of the surrounding parts, and if from its nature it endeavours to renew itself and pass out of the nerve, relaxation takes place. These are two circumstances belonging to the law of contraction. The first is that this alternate contraction affects certain muscles and not others, such as all the straight muscles, especially when they are cut out of the body, on the other hand in muscles that are not straight as in the vesica urinaria, we see nothing like alternate relaxation. When distended, a stimulus will make it contract, but it will go on to a relaxed state and continue in that. An explanation of this may be, in the straight muscles I can not conceive but that while the relaxation follows the contraction, it will not put the muscle straight, the oscillation will produce the alternation. It is not easy to conceive that



16 the relaxation will stretch out the muscular fibre. But when it is connected with a quantity of cellular membrane, that too will hinder the stretching out of the muscular fibre. A difficulty attends the contraction of the muscle of the heart, of which you may try this experiment. When there are a set of fibres about a hollow cavity; first tho' they surround a cavity, they are much in the condition of the muscles out of the Body. I take it to be owing to this that from the connection of the vessels it pushes out a quantity of blood and is relaxed again. It chiefly happens when the muscle is cut out of the Body that the fibres more easily recover their straight situation; and also the heart is entirely muscular. Another seeming difficulty arises from the motion of the intestines alternately contracting and dilating but I imagine there is a fallacy. It is true the muscular fibre in the bladder suffers a relaxa-

tion by the nervous power passing out of it 17 And the same motion in the intestines is only propagated from one place to another. Was not the muscular fibre alternately dilates or contracted it is only in consequence of the motion of air or liquid that that alternation is kept up. Further it is only the ordinary degree of force that can produce this alternation. On the other hand, a certain degree of force continues to go on and contract, which contraction is not easily overcome by antagonists muscles. This is what we call a spasm. It certainly depends upon the particular organization of a muscular fibre. Next we consider the alternate vivacities, of exercise & rest, sleeping and waking

— Lect. LVII. Feb. 11<sup>th</sup> —  
With regard to motion and rest we shall offer our conjectures on the theory. Hitherto the Theory of this subject has been acknowledged

18 to be obscure, and must be so till we know more of the nerves of which it is an affection. The cause of waking has been supposed to be a fluid secreted; and it has been thought that it must be interrupted, and that waking should cease for some time till it is renewed again. Very many objections lay against this theory. It is difficult to say how such a fluid as the nervous should be secreted and how it should have a receptacle. I pass over many arguments; the chief is this, that the doctrine of a fluid is not at all reconcilable with the phenomena of sleeping and waking. A person after labour both of body and mind is under a strong propensity to sleep; a certain stimulus will dissipate that propensity, and establish the most perfect waking. Now stimulus may give motion but I have got the least idea of its supplying matter. And the effect of stimulus goes so far that we can not suppose that sleep depends upon an exhausted accumu-

lation. Also sleep can be subjected to periodical habits, which too can not be explained upon the theory laid down. The periodical habits affecting secretion are much more liable to be interrupted than these that are purely nervous, such as sleep and waking very purely are. Sleep and waking depend upon a certain train and order in the train of our thinking arbitrarily. We must therefore seek for the theory of sleep and waking in the cases of motion and rest. My notion of the nervous power will appear

gaudio in the *Morbi solido vivi* p. 191 says "Hoc evoppono"

"voluntate" He adds "

"superisit." That is incompatible with any notions of an indivisible soul. He proceeds "

"we agree that we are to go on in our query concerning it as residing in the Body. He says it appears