

20 more readily in the solids than in the fluids; but if you go to Hallers notion of the glutin, you can not avoid its formation in the fluid out of which the solid is formed.

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"compression". This is the notion we would give you. Here is a quantity of Iron calcined; it no longer shows its magnetism; but with grease you restore that again; now if magnetism depends on a certain fluid, where was it when the Iron was in a state of scoriae. Sulphur is an electric; fuse it & it will be a non-electric; it will conduct like water; again pour it into a drinking glass it becomes an electric nay an excited electric. It has a quantity of matter accumulated around it that it had not before. If electric attraction and that of cohesion depend upon a subtle elastic fluid, change that fluid and a new modification takes place.

It applies itself to matter, modified or arranged under a certain texture. Our nervous power is a mixture to which the subtle fluid is applied. "adipose observatur" I must not now give the commentary that these Paragraphs would require. It must not be considered as belonging to that solid "in se sim-  
pliciter speculatum"; but as it is connected with the rest of the system. It is not the glutin of Haller nor is it the vis insita. I deny that it is absent in ~~integro~~ in integro; that would equally apply to destroy the organization in that fibre. The degree of flexibility must have a share. Nor would I allow that it has no connection with the firma partes.  
"nequeat

"dilatari" If he means by this to explain a vis insita, that we must not assume an hypothesis I grant him. He allows else where that peristalsis intervenes in propulsion and

22 contraction; but nothing but mechanism can be the foundation of all our reasoning.

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Does Doual?"

I agree with him that it is not elasticly so. It depends upon a matter under different modifications, and subjected to different laws from each of them. But it does not resolve the whole into sentient principle or exclude it. In what follows "

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" we entirely conclude with Gaubius. I would willingly comprehend the vegetable kingdom. I go on now to consider if we can find out the laws of it, the causes that may alternately produce this rest or motion. In sleep the nervous power seems to rest, owing to one of three causes. First interrupted motion while the power may still remain. Secondly suppressing the passage free

the fluid itself by changing its condition is rendered immovable. Thirdly it is not impelled. I now consider how far these can take place. Interruption can happen from compression, producing all the phenomena of sleep. In the apoplectic stupor there are circumstances different from natural sleep. In the case of a moderate compression from a quantity of water on the brain a person feels sleepy; therefore a cause of this kind may take place. The causes depending upon the immobility of the nervous power seem more difficult to be understood. But they take place in fact, in cold. Heat is necessary to animals. In no animal does the temperature go lower than the freezing point of water. It is true that some animals live in greater cold than that, but they have a power of generating heat that keeps it up. In many a certain degree of heat is the sole circum-

24 stance determining life or death. In man cold benumbs particular parts; and it certainly acts by first inducing all the appearances of natural sleep. Cold acts by destroying the mobility fluidity and elasticity of our nervous power. The parts of animals that are benumbed, and small animals are recoverable to life by heat alone, as I have seen in swallows &c. The sleeping animals are waked in a greater degree of heat than is necessary to their Bodies. And this happens without affecting the mixture of the fluid otherwise than by putting it into a fluid state. Also to want of mobility of the nervous power I refer the operation of narcotic medicines. The theory must be very purely Speculative. I said just now that the action of attraction of cohesion is exactly connected with a state of mixture. Thus when we

consider the small quantity of the fumes of Lead that will destroy the fluidity of mercury, and the small quantity of tin that will destroy the ductility of gold rendering it brittle it depends upon a subtle elastic fluid. Hence we are drawn to conceive how our nervous power may be in some measure changed in the same way, as in the operation of narcotics. I shall consider this hereafter. I dare say whether they operate on the mixture of the nerves or on the subtle elastic fluid, they affect the mixture of the matter of the nerves. Narcotics do not operate on the organization of the sensorium commune. You are acquainted with the experiments of White and Monro on this subject; White says that opium acts on a part of muscular fibre. Haller has doubted of that, but his opinion may be supported; and it is rendered highly proba-

26 ble from the topical affection of living bodies, and therefore in a great measure independent of the sensorium commune. And so we may conclude that narcotics act as cold, in destroying the mobility of the nervous fluid. As to the third set of causes they lay the body at rest. day a man quite at rest, lay him soft, remove the impressions of light and noise and at any hour of the day most persons may be lulled to sleep. Also when the mind is occupied too much with one object the effect of impression is taken off, and if no commotion is produced a person will go to sleep. such is the effect of a dull discourse. But it is equal whether the discourse is dull or the hearer has not common apprehension. The diminution in point of force of external impressions, and the impulse of the arterial blood in the Basis

of the Brain, produces sleep. If the nervous power is an elastic fluid it will always endeavour to come to an equilibrium viz: a state of perfect rest, which though difficultly compatible to its nature it comes nearer and nearer to. Upon this have we explained contraction and relaxation, and so in sensation and motion. The repetition of a sense, and motion resisting that repetition is reconcilable, and I shall reconcile it in another place. The tendency to equilibrium must be owing to want of external and internal impression, and to attention without emotion or volition. Secondly whatever disturbs the equilibrium, wakes a man. —

Lect. LVIII. Feb. 12<sup>th</sup>.

We rejected the supposition of a fluid alternately exhausted and supplied again, as being the cause of sleep and waking. It depends upon the causes that occasion the motion or rest



28 of this fluid. As the nervous power moves  
certain portions of our system only, its mo-  
tion may be interrupted. First by compression.  
Secondly by its being more or less fluid, as in  
the operation of cold and heat, which operate  
in this manner, and I allude that narco-  
tics probably act by destroying its mobility.  
Thirdly this fluid may rest if not impelled,  
as being elastic it has a tendency to a per-  
fect equilibrium. The atmosphere around  
our earth would rest were it not for  
external causes, such as compression and  
rarefaction. So by the removing all exter-  
nal impression, and weakening all internal  
we bring on nearly a state of sleep. For  
then is an interruption to its motion, as  
otherwise the ordinary impressions that

move us when awake would move us as well. 29  
so when sleeping which is not however the  
case. Some degree of compression does  
take place, but not clearly or evidently.  
Any of the modes of compression that  
we know do not; But what is analogous  
to it will do; the nervous power is confined  
to the nerve. I said before that it was  
confined between either extremity and be-  
tween surrounding cellular substance. We  
may suppose it confined by the enveloping  
membrane. Probably it goes near to the  
subdivision of the nervous fasciculus. If the  
nervous power must go to the extremity  
of the nerve, go along one fibre and not  
the rest of the same fasciculus, we should  
have stimuli acting distinctly on us in sleep.

30 We must suppose the medullary substance  
confined by that envelopment. I compare  
the nervous power formerly, to elastic mat-  
ter running along a chord, wire &c. I ~~now~~  
add that we know elastic matter would not  
be accumulated upon nonelastics, if it  
was not exhibited by electricity, and is there-  
fore surrounded by electric air: The me-  
dullary substance of the brain is in some  
measure confined; but it has a ~~more free~~  
communication with the <sup>rest of the</sup> system than a-  
ny other part. The nervous power is con-  
fined to the nerves more distinctly. But  
in some degree animal substance is  
flexile and contractile and every portion of  
simple fibre is in a stretched state and  
therefore tends more and more to con-  
tract. So soon then as the impression

of external and internal impressions is  
removed, the contractility of these fibres  
must be at rest, and ~~render~~ the motion  
of the nervous power left free. The invol-  
oping membranes of them get into their  
contracted state and render the impressi-  
on left free. This coincides with Haller's  
opinion where it is not explained by him;  
I explain it upon a different footing. His  
opinion goes upon the supposition of ner-  
vous tubes, being a continuation of arte-  
rial tubes and depending upon the mass  
of blood. I should confirm and illustrate  
my opinion by applying to the various  
phenomena of sleep and waking, I must  
be content however with general princi-  
ples; some such applications will occur to

32 us hereafter. I now go on to speak of  
some other general affections of the ner-  
vous system, and particularly of its ge-  
neral distribution. The nervous power  
must go into every part of the nervous-  
system that is open, and is constantly pre-  
sent in all the organs of sense and mo-  
tion; and is so present independant of the  
common origin. We may suppose its in-  
stantaneous action depends upon the ner-  
vous power in every muscle; and their con-  
tractility is not only simple elasticity but  
it is a power always tending to contract,  
which has been called the tonic power.

The quantity admitted into, and at any  
time present in muscular fibres must  
be according to the degree of their extensi-

on. Hence in the contracted state the power 33  
of the will has no effect; on the other  
hand this proportion of nervous matter  
in the muscle, to the extension of the  
muscular fibres, explains that all sorts  
of extension proves a stimulus to mus-  
cular motion. Now whether extension  
is from various external powers, from  
the weight and tension of the parts, it  
must be connected with all these exter-  
nal powers that stretch animal fibres;  
Hence the effect of extension producing  
contraction, will especially appear in  
these hollow cavities. Where there is  
such an opportunity for extension as in  
the stomach, it is plainly illustrated. This  
applies to the whole system of blood vef.

24 sils. And if I say that muscular action  
is extended by extending the various sur-  
rounding elastic parts, a probability ar-  
ises that the fullness or emptiness  
of blood vessels is <sup>the</sup> ~~the~~ of tension, or want  
of it, in the nerves. Some persons addit  
robur. Let me illustrate the matter. As  
in the Arterial system the first thing to  
be observed is curves; it is especially by their  
length that they admit of extension, and  
therefore are liable to greater variety of it.  
The result of different experiments on this is  
that an Artery contracts to more than its  
half, to wit down from 27 to 12. Now  
the extremity of the artery is one extremi-  
ty of the blood to be stretched, therefore the  
tension applied must have great effects  
upon the tension of the whole sangui-

rous system, and must therefore affect 35  
the nervous system. This will explain the  
effects of the want of or increased determi-  
nation of the blood to the surface of the  
Body, where the extremities of the arte-  
ries chiefly are; and the internal extremi-  
ties every where meet with the same thing.  
Now while the surface of the Body depends  
upon the state of the surface and is con-  
nected with the arterious system, it must  
be added that this is the most extensive or-  
gan of sense. One application, if we may  
presume is (as I shall shew to be the case  
hereafter) that there is a connection be-  
tween the different parts of our system,  
ratione officii we must admit that such  
connection certainly is between the heart &



36 arteries. And a diminution of the nervous power in the extremities, will determine the same more copiously to the heart, and produce fever. Further if want of tension determines to the heart, the resistance will be much stronger still, when the extreme vessels are spasmodically affected. A particular difficulty arises to me from touching the same subject in a clinical, and in a physiological lecture; Here I am confined to give the principles, there, the application. I go on to speak of other parts of the system; and first the Stomach, as a source of the manifold internal impressions which I spoke of before. It is now to be added that it is a part of the

system capable of the greatest resistance 34 in respect of tension. It is at one time contracted to the capacity of an intestine, and at another distended to an immense size. Secondly its blood vessels are liable to suffer the same resistance. Now when the stomach is injected in these different states; in the one state, viz. the contracted, it receives very little injected liquor; in the other, to wit the extended, it will perhaps receive eight or ten times more. Now its muscular fibre must in a particular manner be affected in those different states. And what a prodigious quantity of nervous power is distributed to the stomach in one or other of these states,

38. It must further be variously affected from its sensibility. again as an organ of motion it must be variously affected by tension, as the nerves are affected by the tension of its elastic membranes, and these by the tension of the blood vessels. Therefore the stomach must have very great influence on the equilibrium of the nervous system. The conclusion is, that the stomach, as the most fruitful of internal impressions, must, by its equilibrium affect all the other parts. Is there any other reason for the sympathy of the stomach? When I thus speak of a part having considerable influence upon the rest of the nervous parts, it must

show that by its influence upon the <sup>39</sup> sensorium commune; Hence the connection of the stomach with the head, and the great and mutual affection of each on the other. If the extremities on one hand and the stomach on the other do so influence, and be influenced by the common origin, there must be a never failing connection between the stomach and the surface of the Body. You will find, all the parts that are most liable to a variety of tension and sensibility, are much more liable to various affections. So the intestines are next to the stomach, and next to them the uterus; also taking along with me the sensibility I would