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Life a forced state. —

We have ^{to} that every living organized body is governed by excitement; if so then must life be a forced state; and of course the body must, in time, wear out.

A knowledge of the laws of [organic] life must be of the first importance to the physician; for it is the end of all the studies of the physician to preserve life; and this cannot be perfectly done until we know in what life consists.

When Boerhaave likened the human body to an hydraulic machine, explicable on the principles of the mechanic philosophy, he, at that time, rendered a great service to the student of anatomy & surgery, that is to say, to the student of the visible & palpable parts of our body; — but he went not far enough for the physician, who has to do with what Sydenham calls, the homo internus, or that animating something, included in the tangible parts, as in a cover; and is that which moves, & actuates the whole system, but which eludes the eye of the anatomist. — In speaking of the inadequacy of anatomy to help us to the knowledge of the laws of the vis vitæ or life, I shall, lest I should be misunderstood, quote the words of Dr. Rush, Prof. of Theory & Practice of Physic in the Un^{iv}. of Pennsylvania,

He says "simple anatomy is a mass of dead matter. It is physiology which infuses life into it. A knowledge of the structure of the human body occupies only the memory. Physiology introduces it to the higher and more noble faculties of the mind. The component parts of the body may be compared to the materials of a house, lying without order on the ground. It is physiology, like a skilful architect, which connects them together, so as to form from them an elegant & useful building." (Lecture 1st on animal life.)

Boerhaave's attachment to the laws of the mechanical philosophy had a tendency to divert his mind, as well as the minds of his pupils from seeing those powers of action ^{or life}, and laws of motion within us, which have scarcely any resemblance to mechanical, or even chemical operations. I mean those powers which depend on that excitability, & nervous energy, w^{ch} are the ^{peculiar} attributes of living organization. Vitalis or vitality are but other terms for that principle of preservation & renovation within us; that wonderful quality, w^{ch} acts independent of mechanical, or chemical laws, and which leaves no other traces of its presence in the body, than what is discernible by the motions of life.

Aphorism 1.^{5c}

All the living parts of the body have, beside those attributes common to all bodies, as solidity, extension and gravity, a peculiar something w.^c distinguishes the living from a dead body. &c. see Synop. p. 20. to 22.

(See Dr Rush's 1st Lecture on Life)

By the term excitability we mean that property in the human body, by which motion is excited by means of impressions. Some call this property irritability, contractility & mobility.

By sensibility is meant the power of having sensations excited in the mind by the action of impressions —

Life is the effect of certain stimuli acting upon the sensibility & excitability w.^c are extended, in different degrees, over every external & internal part of the body. Dr Cullen, long before Dr Brown wrote, declared that the human body was not an automaton or self-moving machine; but was kept alive and in motion, by the constant action of stimuli upon it.

These stimuli are either external or internal. The external are light - sound - odours - air - heat, exercise and the pleasures of the senses. The internal stimuli are food, drinks, the chyle, the blood, a certain tension of the

of the glands, w^{ch} contain secreted liquors, and the ex-
ercises of the faculties of the mind.

As to the effects of light, plants will fade grow
sick & die for want of light, and so will man.

"Organization, sensation, spontaneous motion, and
life exist only says Lavoisier at the surface of the
earth, and in places exposed to light." Without
light says that celebrated chemist^{all} was lifeless, in-
-animate, and dead!"

Sound has a more powerful influence, & is a greater
stimulant than is commonly supposed. The effect of sounds
is often imperceptible from habit. There are innumerable
impressions daily made upon us, which, from habit, are
not followed by sensation. Those who have ascended
several miles from the earth in a balloon, tell us of an
entire silence which prevails in those regions that is aw-
-ful, and which ~~makes~~ occasions a depression of the spirits:
(e. g. Ave-Maria bell) We are powerfully effected through
the medium of the years. Fear produces trembling pale-
-ness & other marks of debility; while martial music, by
its stimulus dissipates this debility, and gives a tone to every
fibre. And it is constantly remarked that deaf people
have low spirits.

Smell has a sensible effect in sustaining life. Volatile spirits, as hartshorn will restore the fainting system, and will recall life, when, apparently just ready to depart. Fragrant perfumes are so many cordials to our drooping spirits; while ungrateful odours will so depress the powers of life as to cause a person to faint away.

That Air acts as a powerful stimulus upon the system through the medium of the Lungs is too well known to require us to adduce fresh proofs.

Digestion is the selection & conversion of some foreign substance into our own nature; but there are within us two organs, w.^c perform, at the same time, two different kinds of digestion; for while the stomach is digesting solid substances, the lungs are digesting air. When we inhale the atmospheric air, the Lungs in the action of breathing, separate a portion of that inspired mass, called oxygen gas or vital air, which entering the blood, vivifies & animates the whole frame. Between this oxygenation of the blood through the lungs, and the digestion of the more solid food by the stomach, there exists an inseparable sympathy and a beautiful balance. In a word, it is the process of oxygenation, when breathing the free air of the mountains, or of the open ocean, that ex-

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excites the dormant energies of the brain & nervous system, w.^{ch} invigorates every fibre, and which gives strength for debility, and activity for sluggishness. Such is the conspiration of action between the powers of the stomach and respiration of the lungs, and such the sympathy of both with the whole of the human system, that these two organs are, either primarily, or secondarily affected by every malady that "flesh is heir to". But I have treated this matter so fully in my printed lecture, entitled "cautions to young persons concerning health, and particularly respecting the pernicious use of tobacco & ardent spirits", that I need say no more in the subject in this place.

That Exercise acts as a potent stimulus to the principle of life is equally well known. Indeed there are no drugs that act upon our blood & juices, like the joint force of all the muscles of our body, acting & reacting, as in a regular course of moderate exercise.

That Heat is an uniform & potent stimulus in sustaining life is so generally acknowledged, that the terms seem nearly synonymous. That heat & life go together is obvious from a suspension of all the functions in some animals, during the winter, when they remain in a torpid state, and only revive on the return of the warmth of spring.

We have P, that without heat as an exciting & preserving stimulus, vegetable & animal life cannot be supported. And that the denser, or more compact the solids of an animal, or parts of an animal, the stronger and less irritable is the animal or parts of the animal. Thus the muscles are in a great degree irritable, but their irritability lessens as they become tendinous, and is in a manner lost when ossified; and as to the bones themselves, they are entirely insensible.

On the contrary, when by inflammation the fibres of some of the least sensible parts are elongated, and the cohesion of their constituent corpuscles diminished, their irritability & sensibility is proportionably increased until it arrives at the extreme, when the sensibility & irritability diminishes until it is lost. This we presume arises from the receding of the particles of matter from each other by heat. This will allow us to make a digression on the subject of heat.

There are two powers, or primitive forces, in the great frame of nature, viz that which causes weight; and that w^c produces heat. The one tends from the circumference to the centre of the earth, and is called gravitation; the other tends from the centre to the circumference and is called fire. altho

^{Although} the directions of these two powers are diametrically opposite, the action of each is not the less exercised; they ballance themselves without ever being destroyed, and from the combination of these two powerful agents, alike active, all the phenomena of the Universe result. When the attraction or gravitation prevails things are in a solid state. When fire, or heat is most powerful they are in a state of vapour; and the liquid state is the point of equilibrium between both these extremes.

Fire is invisible to us unless it seizes hold, of a combustible body. It then removes the particles of that body farther from each other, by enlarging & expanding the elastic fiery fluid that surrounds every particle of solid matter in the Universe. If this be done in a moderate degree, it is discoverable to our feelings by an agreeable sensation of warmth. If in a greater degree, it becomes hot & disagreeable, if it be a piece of iron it may grow red hot. If the heat be still increased, the atmosphere surrounding each particle of matter is so expanded, extended, and attenuated, that the once hard metal is converted into a fluid that runs like oil. If the heat be indefinitely increased, then the elastic,

etherial atmosphere surrounding each corpuscle is attenuated to that extreme degree of exility, that it becomes volatile, that is, to say, it flies off in the form of an elastic vapour. That the particles of the heaviest metals will recede from ^{any agitation in the particles of air or of other denser substances, will operate equally} each other by a very slight degree of heat is made evident by the expansion of the Mercury in a thermometer; and that the slightest friction will also effect this is apparent from Bennet's electrometer.

e. g.

We mean to confine our observations at this time to the effects of heat on an animal body.

It appears from what has been said, in our last lecture, that phlogiston, oxygen, or the inflammable principle, is merely evolved by fermentation & putrefaction; but that in nutrition it is immediately held in solution by the gastric juice, & in the chyle formed by it.

The phlogiston or inflamm. principle thus entering the circulation with the chyle, after answering its vivifying purposes in the system is thrown out again by the lungs into the air, which it phlogisticates, ^{renders} it unfit to be again respired: So you see that the chyle which enters our system (besides bestending the vessels, & conveying a fresh supply of matter to repair the daily waste of the body) conveys also a portion of that vivifying principle w. gives motion to the Universe & life to nature.

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It appears also that the circulation of the blood is necessary to the excitement of the brain; and this not merely by the mechanical distention of the vessels; for the blood stimulates the heart & arteries by a specific action; w^c specific stimulus depends on the life of the blood. If we take into consideration also the action of respiration, w^c is a kind of combustion, we shall acknowledge that life & caloric, or heat go together. If we call to mind the operation of this powerful agent, when combined with the concentrated, or latent oxygen in the hens-egg, by the action of which life is rendered apparent; and if we reflect on the means used to restore life in a drowned person, we must be made sensible of the powerful efficacy of the principle of heat in our bodies. When our bodies are totally deprived of this fluid matter of heat, they are said to be frozen; when they have a proper quantity, they are in health, & fit to perform all their functions, and are said to possess natural heat; when too much enters them, it causes inflammation; but when a great quantity is forced into our bodies, and so as to separate its constituent particles, it is called burning. Now it is the business, and I believe I may say the duty of the patient & the physician to regulate this active principle in our bodies, both as it regards food, exercise, & the use of spiritous liquors: for on this depends the Broussian system of excitability. So much then for the sti-

stimulus of heat. Let us close the subject with the stimulus
of thought. That the body operates on the mind, and the
mind on the body no one can doubt. The brain, says Rush,
repays the heart for the blood it conveys to it, by reacting
on its muscular fibres. Men, says the same author, of great
and active understandings, who blend ^{& exercise} temperance with
their studies, are generally long lived". The imagination
says he acts with great force on the body; but it is the
passions that pour a constant stream on the wheels of
life" (p 391. Vol 2^d). Nevertheless study & thought wears
out the body, and is proved by experience as well as scrip-
-ture to be wearisome to the flesh". Not merely thought, but
even sensation is wearisome to the flesh, as a sort of fatigue
is induced by it, as well as by voluntary motion. All that
intercourse w. is carried on through the nerves, whether towards
the brain, as in the case of sensation; or from the brain, as in
acts of volition, tends to produce a temporary inability for
further exertion. wear out the animal powers. And if
intense ^{long continued,} thought, or thought not terminating in any outward
action, will also produce a temporary inability for further
exertions.

[From Dr. Blaine?]

From these facts we perceive the necessity of sleep, in which
there is a temporary suspension of sensation, volition & thought.
Sleep is a resource of nature whereby the powers of life recover
themselves after satiety & fatigue. The

The exercise of sensation & voluntary motion in a moderate degree, is conformable to the intention of nature, and therefore salutary. It is only when they are excessive, that they tend to wear out the powers of life, especially if these are not duly recruited by sleep. During sleep the powers of life appear to be so much accumulated, as to give a renewed disposition to action in the mind as well as the body.

It would seem that there is a certain quantity of the aforesaid living power flowing into the system in a given time. This living power is not all necessarily employed at the instant it flows into the system; but it may be accumulated to a certain degree, but only to a certain degree; for if it be not made use of when it is so accumulated, it will be dissipated and lost, as is the case when a person sits still, or lays a bed instead of exercising.

From these principles flows this practical maxim, viz, that when life is threatened by certain diseases of which the chief symptom is irritation, any means by which sensation, whether natural or morbid; and muscular motion, whether voluntary or involuntary, convulsive or spasmodic, can be soothed or suspended, will prove salutary, by allowing the powers of life to rally as it were, to recover themselves: hence the use of opium in all diseases of inordinate irritation. From all that has been said in this lecture it will appear that life is a forced state, and to excite, or moderate it, is one of the duties of a Physician.