First principles of medicine / By Archibald Billing.

For

The London Medical Society

with best wishes of

T. Willing

FIRST PRINCIPLES

OF

MEDICINE.

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PRINCIPLES,

&c.

THE first step towards treating disease successfully, is to ascertain as far as possible, the nature of the *alteration* which has taken place in the *seat* of the *disease*, or what has been called technically the *proximate cause;* in default of this knowledge which is sometimes unattainable, we can only depend upon analogies, drawn from what we know to be the fact in other cases, and from *physiology*, which is a careful *observation* of the *phenomena* resulting from the *functions* of the different *parts in health.*

An accurate knowledge of the *functions* in their healthy state is the more necessary, because considerable deviations from the ordinary routine take place without disease, and as they are frequently much disturbed without any discoverable alteration in the structure of the organs having taken place, morbid anatomy alone will not be sufficient to elucidate all causes of disease, whilst on the other hand it is necessary to be aware that a considerably diseased change of structure may exist with little or no interruption of function.

The *modes* by which students may attain a *knowledge* of the *nature* of *disease*, after learning physiology or

the nature of healthy functions (which is attainable from lectures), are, accurate observation of the diseases which take place in external parts as they are submitted to our senses in CLINICAL SURGERY, and in the functions of internal parts as met with in CLINICAL MEDICINE; and MORBID ANATOMY, the examination of of what is the degree and nature of alteration which has taken place in the structure of the seat of the disease.

The object of lectures is to convey to the student in a condensed manner, that knowledge in abstract, which will enable him to understand what he sees at the bed side, and the observations of the clinical professor; without which clinical instruction all that the memory may be charged with from books or lectures is but vanity.

Without entering into minute anatomy, it may be necessary before proceeding any farther, to give a general idea of the *apparatus* which supports the life of man, consisting of, the stomach and intestinal canal called the PRIMÆ VIÆ, the ABSORBENT VESSELS, the HEART and BLOOD VESSELS, and the NERVES.

The heart is divided by a partition, each side containing a certain quantity of blood, more or less of which is squeezed out at each beat or contraction, the blood from the left side is sent through the trunk and branches of the arteries, to nourish the different parts of the body, the overplus, and what is spoiled by use, being returned through the veins to the right side, which sends it by arteries into the lungs to be purified, whence it is returned by veins to the left side *again*, thus constituting what is called the CIRCULATION.

I state the nature of the circulation first with which the individual born begins life before it has taken in any food.

During health, the process of NUTRITION is thus carried on; the *food* swallowed is DIGESTED by the action of the *gastric juice* in the *stomach*, that is, it is converted into a grey pulpy mass called CHYME, which passes on into the intestines where it is mixed with the BILE. The use of the bile is to *unite with* and *separate* the *feculent parts*, as white of egg is used to clear wine. Now, if a pulpy mass be allowed to stand in a vessel, the solid parts will settle to the bottom, but if rolled about in the hands, or in the manner effected by the peristaltic motion of the intestines, the more solid parts are kept in the middle, whilst the surface of the mass is the moistest; and thus a whitish liquid called CHYLE, which was disengaged when the bile united with the feculent matter and which caused the chyme to appear grey and constitutes the new nourishment, is kept next the coats of the intestines where it is sucked up by the tubes called ABSORBENT vessels, and these absorbents on account of the white chyle seen through them are called LACTEAL (milky).

The *lacteal absorbents* carry this *fresh supply of nourishment* to make NEW BLOOD; they *deliver* it first into the *veins*, near the heart, where it is mixed with the old dark colored blood, which has been circulated and is on its return to the right side of the heart, from whence this mixture is sent through the lungs, to be purified, when it becomes bright scarlet, and is then returned to the left side of the heart, which sends it through the arteries all over the frame to supply its demands.

All the business of constant support and renewal of parts, and supply of secretions, as the growth or repair of bone, muscle, membrane, and other structures, the formation of bile, saliva, mucus, and other secretions, is carried on by the extreme minute branches of the arteries; and whilst they preserve their proper size and tone, all goes on well, when their action is deranged, disease commences, often prefaced by pain or other disorder of the nerves; these terminal minute branches of the arteries from their fineness are called CAPILLARIES (from capillus, a hair).

The *color* of the *blood* is caused by RED PARTICLES diffused through a transparent fluid which is called *serum* (whey), from its resemblance to that fluid; when blood is first drawn the red particles may be seen floating about by the means of a microscope, but when it stands they settle down to the bottom and form a cake or clot (called cruor or crassamentum).

Some capillaries are too small to admit the red particles unless when they are enlarged by inflammation, as in the eye, which when inflamed changes from white to red; besides that, even the red capillaries are so minute that they are not visible individually to the naked eye till enlarged by inflammation.

The body is nourished by the arteries depositing in appropriate parts the various constituents of the blood, which is sent through them by the heart. In this way muscles, bones, membranes, &c. grow and are nourished, for the blood contains the constituents of each; fibrine, &c. for instance, to make muscles; lime, &c. for the bones; albuminous and watery fluid for the formation of membranes, and to supply the secretions and ex-

halations, which are necessary to lubricate the mucous and serous membranes.

Though a consideration of the phenomena resulting from these depositions will assist us in our explanation of disease, we cannot exactly ascertain how the depositions themselves are originated. Do arteries build up a bone merely by the addition of homogenous matter? and, are the secretions and exhalations modified by the *calibre* of the minute branches, *admitting* only the vapoury parts to the surface of the serous membranes and of the skin, whilst they permit the transparent fluid parts of the blood to pass to the mucous surfaces and keep back the red globules. This mechanical explanation might suffice, in part, in the instances adduced, but when we come to the nutrition and renewal of muscle, and the formation of peculiar secretions, we must look for some still uncomprehended agency, which modifies the materials, conveyed by the arteries, whilst they are depositing; even with respect to the deposition of bone this agency is required to solidify the new particles, which are fluid in the blood; this power can be no other than chemical, the processes when examined will be found to be chemical *precipitations* by which new matter is deposited, and *decomposition* by which old matter is separated, and then carried off by absorbents, and thus the support of the frame in health and the changes of disease proceed. In this investigation we may advance a considerable way, though we cannot come to the knowledge of the ultimate principle on which organic life depends, or we should be able to construct a man: as an instance how far we can go, we can analyse bone and we may explain how bony matter

is deposited from the blood by precipitation, and we know that the shape depends on the periosteum, or membranous mould in which it is cast; but here we stop, we cannot discover how in the minute embryo in the womb, the membranes were first determined in their shapes; we here arrive at the confines of our knowledge, and must confess an infinitely wise FIRST CAUSE who does not permit us to know more than the phenomena by which we can judge how, in many instances, to avail ourselves of the means to regulate the complicated apparatus which HE has endowed with life.

The deposition of bone is a combination of chemical precipitation and crystallization, modified by vital actions, as for instance when there is periosteal membrane we see that it keeps up a vital state of bone whether in the bone of a leg, or a tooth, when there is no membrane attached as in the enamel of the tooth, crystallization with the temporary membrane which forms the mould decides the form of aggregation; in case of fracture of a bone the surrounding parts decide the form of the CALLUS which reunites it. Whilst bone is growing, (as shewn by the common experiment of feeding young animals with madder so as to produce variegated deposits) there is a change as to disposition of the bony matter going on, but there is no reason to suppose that the substance of a healthy sound bone of an adult is changing, no more than a tooth, or the wall of a castle though there are preparations ready to repair a breach if made.

The arteries of the periosteum are always ready to repair, and as soon as they get notice they begin to deposit (the bricks and mortar); What is the notice?

Why do they deposit when they get it more than they did before? The notice is inflammation, whether it be from a fracture, a blow, or other accident, and the vessels by this inflammation becoming distended, (with or without rupture and extravasation) and the part spongy, there is if not stagnation a sufficient retardation, of the blood to allow of crystallization of bony matter. When do the workmen cease depositing? When the spaces prepared by the inflammation are filled; if there be not enough of bone deposited to unite a broken limb the surgeon often rubs the broken ends against each other to excite new inflammation, because strange as it may sound to the unlearned we cure in many instances by producing inflammation. We may thus account for the hopeless work of the vessels in the tooth-ache, the injury is in a part which cannot be repaired, as being destitute of membrane; hence the inflammation excited in the sound part produces only a useless effort, as we see sometimes evinced by morbid growth at the point of the root, but no repair of the mischief, so that the tooth must be removed altogether. The same effort which repairs, if excited morbidly produces diseased growths, such as bony tumours from syphilitic or other inflammation of the membranes of the bones.

During health the capillary arteries go on with their work of nutrition and secretion, the muscles are kept up, the mucous surfaces are kept lubricated, just enough to prevent any sensation from the substances which pass along them, the serous surfaces sufficiently soft and moist to slip over, and rub against each other without sensation, and the skin is kept soft by an insensible

vapour; all this time there is another process going forward also, which is the *removal* of *superfluous matter* by the *absorbents*, if it were not for these there would be inconvenient accumulation of what is deposited by the arteries, the serous cavities as that of the abdomen for instance would become dropsical, if the capillary arteries went on moistening the internal surface and there were no absorbents to carry off the superfluous moisture, thus we see that absorbents take up the nourishment from the food to supply the wants of the system, absorbents take up also the particles which become superfluous according as the arteries deposit fresh matter, and these absorbents, like the lacteals, mix their contents with the old blood to be repurified; the deposit or precipitation of solid matter by the arteries is not difficult to understand, and we can by a reference to chemical action account for the *removal* also of *solids*, for solids become *fluid* (or gaseous) by what is called spontaneous *decomposition* and thus *removable* by *absorbents*, now whilst bone is healthy it is protected by its membranes from the action of solvents, but when inflammation surrounds it there is an extravasation of *serous fluid* in *contact* with it which helps to dissolve it and when dissolved the absorbents will carry away the solution.

The REMOVAL of BONE by the *pressure* of *tumours*, aneurisms, abcess, &c. as well as the CHANNELS left in *exostoses* for the *vessels* which *traverse* them, is effected by *pressure against vessels*, *not against bone*, the pressure of a tumour causes death of the part of bone, by compressing its vessels and so stopping the supply of nourishment, the bone when dead becomes decom-

posed and is carried off by absorbents; as to the channel in the growth of an exostosis, or in the natural growth of the bones of an infant's head, it is merely the deposit of bony matter *by the side* of those vessels which previously existed.

Arteries are endowed with a power of contracting on their contents so as to continue full, even when a considerable quantity of blood has been lost either by hæmorrhage or artificial means; this contraction then is the action of arteries, and is distinct from, and opposed to, the contraction and action of the heart. This point it is necessary to understand clearly, in speaking of the phœnomena of disease

The HEART *contracts* by *muscular* action and *relaxes* ALTERNATELY, the ARTERIES keep up a CONSTANT *contractile pressure* on their contents, not an alternate contraction and relaxation, but a continued contractile effort which is overcome by the action of the heart, when there is much blood sent into them they are distended, and if there be little blood sent into them, as after hæmorrage, their tendency to contract causes them to close, so as to keep always full, and to preserve a constant stream of the blood even during the temporary relaxation of the heart; and the ARTERIES YIELDING and adapting themselves to the pressure of the heart and RECONTRACTING on their contents, whilst the heart is relaxed and filling, is the CAUSE of the EQUABILITY of the STREAM in the VEINS, nay, the stream even in the arteries is much less in jets than is supposed by those who judge from the mode of its flowing from a wounded artery; for though, when there is a free escape from the wound, the impulse of the

heart causes an unequal stream; it must be remembered that in the tube, unwounded, that force would have been expended in stretching the artery, whereas the artery when wounded, ceases to be other than as a simple tube, the elasticity not being called into operation, on account of the escape of the blood from the wound.

The most simple mechanical illustration perhaps, is the double bellows of a smith's forge, which keeps up a constant current of air; though the handle works with intermissions, so that the blast into the fire would be in puffs, if it were not for the weight of the upper half of the bellows, which keeps forcing out the air in a continued current, whilst the hand is drawing back to make another impulse.

It has been supposed that the circular fibres of the ARTERIES were muscular, and that they contracted and relaxed at each pulse, and that the throb felt, was caused by a dilatation of the artery; those fibres are NOT MUSCULAR, but more approaching to a ligamentous tissue, firm and, though elastic, not yielding to the force of the heart, but on the contrary, preserving the CALIBRE of the artery UNIFORM, as may be seen by laying bare an artery in a living animal, or when the artery is laid bare in an operation; it is LONGITUDINALLY that the arteries are STRETCHED at each injection from the heart, by which their capacity is increased, the consequence of which, from their being bound down in various places, is, that there is a SERPENTINE motion in the artery where it is at all loose.

The fibres of the middle coat of the artery being arranged circularly, allow of the separation laterally, and thus *accommodate* themselves to the *elongation*, of

the tube, whilst they *resist* its *dilatation*. Now it may be thought that the movements of arteries *seen* at the wrist and in the temples is their dilatation, but it is the serpentine motion caused by the alteration of the curve, the artery being elongated at each injection from the heart.

Where the artery is perfectly straight you may lay it bare and scarcely see it move, but the moment you compress it with the finger, or tie a ligature around it, you perceive it pushed at every pulse. To illustrate the deception of the sensation which the pulse gives, as if the artery were dilated at each beat; if a long vein removed from the body have a syringe adapted to one end, the other being raised, or arranged with a spring valve, which yields to the jets so as to keep it full, and fluid be sent through in jets, it will upon pressure by the finger, give the sensation of dilatation, but the eye perceives none: again, if any one grasp the leather tube of a fire or garden engine, the sensation given, will be that of its expanding in the hand at each stroke of the pump, but the eye contradicts the sensation, it is merely the tendency to resume the cylindrical form from the outward pressure of the fluid, but not expansion.

It has been *attempted* to be *proved* that the heart has an *active power of dilatation*,* by which it helps to

* The "*impulsion*" of the heart against the side (which takes place between the first and second sound, that is just as the auricles have filled the ventricles, and the latter become rigid commencing their contraction), is in proportion to its muscular action, and is produced by the heart assuming a form more approaching to the globular, and becoming firm at the same time, as when the gastrocnemii muscles act; the heart being in an angle between the diaphragm and parietes of the chest, the increase of its transverse dimensions has the effect of

refill itself, sucking in the blood as it were, and one proof is brought forward from the heart of large mammalia, as the horse, ox, or whale, which affords the phœnomenon of contracting and expanding after removal from the body; but the expansion is simple relaxation, as when after the fist has been shut with an effort, upon the relaxation of the flexor muscles it will be seen to expand slightly without any action of the extensors; and when a large heart is relaxing, if the hands be pressed on opposite sides of it they will be sensible of an apparently active expansion from the mere gravitating recovery of position of such a mass of matter. The heart, in fact, not opening, but *falling open after* each *contraction*.

It will be shown now, *how* the *blood fills* the *right auricle* which being flaccid is easily distended, but it requires the muscular action of the auricle in addition to fill out the ventricle, which is the use of the auricle; nil frustra natura (Deus) facit. It is the constant pressure and equable stream which refills and distends the right auricle of the heart after each contraction, not any suction (to use a vulgar expression) of the heart, or suction of the chest, as has been attempted to be proved; no effect of vacuum and atmospheric pressure; there is no suction (no atmospheric pressure) during natural

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the driving of a wedge, forcing against the ribs. Now these actions may be very forcible, but if they be too rapid, there is not time for the heart to receive the usual quantity, so that only a little being sent into the arteries at each contraction, the pulse may be small, when the heart is acting strongly, as in palpitations, and an ignorance of this fact might lead to the administration of stimulants when not required (to say the least), if the pulse alone were consulted; cæteris paribus impulsion is increased by hypertrophy, diminished by dilatation.

respiration, for the glottis is sufficient to admit a free current of air; it is only in croup or laboured respiration of any kind that there can be any effect of atmospheric pressure.

A reference to the hydrostatic principle of fluid in bent tubes finding its level will be sufficient to account for the capability of the heart, with little effort, to send the blood all over the frame, and for the re-filling of the heart after each contraction; the heart sends the blood against the force of gravitation through but a small portion of the frame, for in all the natural positions upright, or horizontal, by far the greatest portion of it is below the level of the heart; now the blood being confined in the arterial and venous tubes will of course (on hydrostatic principles) return to the same level from which it flows; and, as to the capability of the muscular power of the heart to inject the parts that are above its level, when any person compares the force necessary to be used in doing so, with the force which an equal quantity of muscle in the arm is capable of exerting, it appears trifling, besides whoever applies the hand to an aneurismal tumour may *feel* the force of the heart. The blood then returning from the parts above the level of the heart, tends to refill it by gravitation, (even if not aided by the contractile pressure of the arteries); the blood below the level of the heart, or rather arch of the aorta, returns by the tendency to find its own level, so that the BLOOD is PRESSED into the RIGHT AURICLE by the *weight* of the *returning blood* from all the parts *above* the level of the *heart* added to the *pressure* caused by the *difference* of the *height* of the *arch* of the aorta *above* the *right auricle* of the heart and in addition by *whatever remains* of the *contractile*

pressure of the *arteries*. Another consideration has been omitted generally in calculating the power and facility with which the influence of the heart is communicated throughout the arterial system, which is, that any retardation which might take place from the friction through the tubes, is more than compensated by the sum of the branches being greater than each trunk from which they arise, so that the flow is facilitated, whilst, on the hydrostatic principle of Bramah's press, though the injecting force of the heart is spread over a greater space it is not weakened, being multiplied not divided, and in injecting the capillaries, hydraulic friction is compensated by capillary attraction.

We must not consider the elastic contractile effort of the arteries as one of the moving powers of the blood, any more than the fly wheel of a machine, or the weight on a double bellows, which only regulate motion, and are in fact a burden on the moving power, though they continue the motion for some time after the moving power has ceased to act. The moving powers are the *contractile force* of the heart,* *gravitation* and the hydrostatic principle above stated of the *tendency in fluids to* RETURN *to the same level.*

By anatomical investigation then we ascertain, that tubes of various dimensions called vessels, and which are named arteries, veins, and absorbents, are the apparatus of every process in the *growth* or *removal*, of all parts in *health ;* and in the *swelling* or *wasting* of parts

* Let it not be objected that some lower animals which have no heart have still a circulation ; the alimentary canal performs the double function of stomach in making the blood, and heart in sending it on when made ; as in my opinion the contraction of the alimentary canal of the higher animals sends forward the chyle in the lacteals.

in *disease;* moreover we must not forget, and it is a circumstance to be recurred to perpetually both in theory and practice, that the *nerves accompanying* the *arteries* throughout *control* the apparatus.

The NERVES are whitish threads which are distributed to every part of the frame however minute, communicating with the brain, for the purpose of informing it of what is going forward in different parts, as when any thing touches the hand, tongue, &c.; and for the purpose of conveying the mandates of the will from the head to the muscles of voluntary motion; and again for the purpose of supplying to *all parts nervous influence.*

The nerves do not blend as they unite into larger and larger trunks, but preserve their individuality however aggregated, like threads in a skein or strands in a rope.

A variety of circumstances lead us to the conclusion that the NERVOUS INFLUENCE is analogous to or depending upon if not identical with the ELECTRIC principle, or fluid, whatever that be; that the nervous influence is generated or secreted in the cineritious (grey) part of the nervous system, and conducted by the medullary (white) part; the *medullary* part in the *brain* being the *aggregation* of the nerves from the frame.

1. The contraction of muscle by passing electricity along the nerve to it either in the living body or when dissected out.

2. The efficacy of electricity or galvanism in restoring energy to the eye or other parts relaxed or inflamed.

3. The effect of electricity or galvanism in promoting digestion when passed along the eighth pair of nerves.

4. Volition is conducted along the nerves with a speed equalled only by electricrty.

5. The extrication of caloric called animal heat, is analogous to the gradual action of a galvanic apparatus, &c. &c.

It is necessary here to state distinctly my opinion respecting ACTION as depending upon the NERVES; I consider that the *muscles* and *capillaries* have inherent in their structures, a faculty of contracting, *organic contractility*, (the vis insita of Haller), this *contractility* being *acted upon* by the *nervous influence*, the *result* is *contraction*, the nervous influence being discharged into them from the nerves, and this discharge may be produced by the contact of a third substance, as the blood in the heart or capillaries, or by the electricity from a charged jar, or by the will, or by the presence of food in the intestines, these being known agents of contraction in the animal.

In every process of the animal frame, organic action is contraction produced by nervous influence; this Bichat calls contraction from "organic contractility," resulting from "*organic* sensibility," which he distinguishes again from *animal* sensibility, thereby making it appear that the nerves act upon an ideal inferior sensitiveness in the structures not confining sensitiveness to the nerves. Now by "*organic sensibility*," must *not* be understood *sensitiveness*, but that liability or *capability* of *structure* to *answer* to *nervous influence*, in the same manner that steam or any other agent produces action in a mechanic structure. I should therefore use the term ORGANIC ACTION, instead of organic sensibility.

What Bichat calls ANIMAL *sensibility*, is a function of the *nervous system alone*, by which communica-

tion is kept up to and from the sensorium, effecting voluntary action by the transmission of nervous influence to the muscles, and by which pleasurable and painful impressions are perceived; pain is the result of injury done to the nerves, and nerves alone, the union of nerve with other tissues being only to effect action, *sensibility* is in the *nerve;* pain takes place in injured parts, which though not under the control of the will, are still abundantly supplied with nerves to produce action, as in the heart or intestines, but this is not "organic sensibility (action) augmented" until it "becomes animal sensibility," as Bichat says, (syst. capill. §. vi.) for in fact it may be seen that "organic sensibility" (action) is diminished in parts where there is pain from inflammation.

In fine I prefer the term *organic action* to *organic sensibility*, and do not make use of the term "*animal*" sensibility at all.

In other words ORGANIC CONTRACTILITY is the MECHANISM, his "ORGANIC SENSIBILITY" is the ACTION of that *mechanism* set going by *nervous influence* as the moving power.

Bichat makes an ideal inferior sensitiveness in the structures, not confining sensibility to the nerves, as he says "the nerves are strangers to *organic sensibility*," this leads him to become visionary, when he speaks of the lacteals exerting a choice as to what particles they will take up, this is mere chemical or nervous effect on their mouths, making them cease to suck up what is unfit for them, whether that be by the unfit matter causing them to contract and shut against it, or to relax so as to lose power, still no election in them, no more than elective affinity of chemistry; from thus re-

fining too much upon the functions as connected with vitality, he overlooked the more simple explanations which physics afford, and says, that it is ridiculous to attempt the explanation of phenomena of changes in animal functions, by mechanical laws and the variations in dimensions of vessels, &c. but I think I have shewn, that what he calls vital laws are but these mechanical laws modified by the Deity: we do not know the intimate structure or mechanism by which a muscle or capillary contracts, but doubtless it is as simple as a pair of lazy tongs, and as easily excited to action, as they are by the hand, or the piston of a high pressure engine is by the steam. There is no subject more interesting, no pursuit more gratifying, than this investigation of the properties and processes of our animal frame; there is no subject of contemplation which gives us so exalted an idea of the omniscience of the Deity, and so humble an opinion of all human inventions, as the excelling utility and efficiency of all its parts; how beautiful, how wonderful then must be the Soul, when such infinite wisdom, such exquisite arrangements are lavished on the structure which it is destined to inhabit for but a short space of time; such perfection in our organization tempts us to believe with Job, that however disarranged by death and decomposition, it may again be called into re-union, and that "in our flesh we shall see God."

The ANIMAL HEAT has been accounted for in different ways by several ingenious Physiologists; from the aggregate of their opinions and experiments I deduce, that *heat* is *extricated all over the frame*, in the *capillaries*, by the *action* of the *nerves*, during the *change* of the *blood*, from *scarlet* arterial to *purple*

venous; and *also* whilst it is changing *in the lungs* from *purple* to *scarlet*.

There is a perpetual *deposition*, by the capillary system, of *new matter* and decomposition of the *old* all over the frame, influenced by the nerves; in this decomposition there is a continual disengagement of carbon, which mixes with the blood returning to the heart, at the time it changes from scarlet to purple; this *decomposition* being effected by the *electric agency* of the *nerves*, produces *constant extrication of caloric;* again, in the lungs that *carbon is thrown off* and *united* with *oxigen*, during which *caloric* is again *set free;* so that we have in the LUNGS a CHARCOAL FIRE constantly burning, and in the OTHER PARTS a WOOD FIRE, the one producing *carbonic acid gas, the other carbon;* the *food supplying* through the circulation the *vegetable* (or what answers the same end, animal) *fuel*, from which the *charcoal* is *prepared* which is *burned* in the *lungs*.

Thus the animal heat is kept up, the EVAPORATION of PERSPIRATION keeps the SURFACE COOL; but in inflammatory fevers where this is *deficient*, the body gets too *hot;* and in low fevers when the nervous influence is too low to keep up the full fire, the surface gets cooler than the natural standard.

Whatever NERVOUS INFLUENCE may be, or however generated, we know, that the *energy of parts* depends upon a something that is communicated to them by the *nerves* in conjunction with the brain and spinal marrow; that while parts are supplied with this nervous influence, they retain their power of action, and not longer; arteries become insusceptible of impression from external agents when the nervous energies are

low; when the vital powers are sunk, the capillary arteries cease to secrete; various *phenomena* of *inflammation* are the effects of *healthy action* of the heart and arteries, and we find when *nervous energy* is *deficient* that parts which had advanced to a certain stage of healing become flabby, as in stumps after operation when the patient sinks; also when the powers of the constitution, the nervous energy fails, the application of boiling water will not cause any effusion of serum under the cuticle (called blistering), nitrate of silver will have no effect upon ulcers except chemical decomposition, not that astringent effect which is the result of contractility depending on vitality. It is well known likewise that a blister not rising from a cantharides plaister is a bad sign, but no vesication will take place even from boiling water, when the vital powers are sunk, as the *heart* has not power to effuse serum; this is a more satisfactory example than cantharides, because the effect of the hot water goes so far as to produce the local injury, for the cuticle may be separated or loosened by the mere chemical effect of the heat, but this takes place equally in a dead body, it is the extravasation of serum under the cuticle to raise it up which requires vital action.

With respect to the action of the heart all are agreed that its action is contraction, by which the blood is sent forward in the arteries, and that the power of the heart's action is measured by the pulse, when there is no organic alteration, such as ossification of the valves at the beginning of the aorta, aneurism, &c.

The action of the arteries also is acknowledged to be contraction, whether muscular or not, but there is some

difference of opinion as to the state of the arteries in inflamed parts. It is very common to say, that in an inflamed part there is an increase of arterial action; but a consideration of the phenomena, and of the nature of arterial action will shew, that in INFLAMED PARTS the CAPILLARY ARTERIES are WEAKER in their action, that there is DIMINISHED ARTERIAL ACTION, for the action of arteries is contraction; now the arteries in inflamed parts are evidently larger than before, less contracted, that is, acting less.

An inflamed part is redder and swelled; where the vessels are visible, as in the eye, we can see the redness is caused by the minute vessels becoming larger, so as to admit red globules of the blood, which before admitted only the more fluid and transparent part, or the minute vessels carrying red globules becoming larger; this enlargement of vessels is not from increased action, but on the contrary from their action being diminished, their giving way, and being *dilated* by the injecting force of the heart. The way to diminish the inflammation is by increasing the action of the arteries, as by cold or astringents, which make the arteries contract, that is, increases their action; so that so far from the arteries in an inflamed part being in a state of increased action, one of the means of *diminishing inflammation* is by *increasing* arterial *action* in the part inflamed. It is common to remark the *throbbing* of the *carotid* arteries as increased action, but the more they throb it shews that they the *more yield* to the injecting force of the heart; when the eye, or any other part, is injured by heat, or a stream of cold air, a blow, or cantharides plaister applied to the skin, &c. the part becomes redder from the

vessels enlarging, and carrying either more red blood, or admitting red blood where there was none before. Now in this first and simplest instance of inflammation, the heart does not act more strongly than ordinary, not affecting the pulse, so that the capillary arteries evince debility, having given way when there is no more force than they bore before without distension; from this they sometimes recover of themselves, gradually contracting to their natural size; or if not, the simple application of cold, or astringent lotion, makes them contract, and the redness disappears.

On the other hand, by savine or cantharides ointment we can produce an inflammation, such a relaxation of the capillaries that those which can be dilated, are, and separate from those which are confined by firm surrounding substance, by which means warts are thrown off, which has been called increasing vascular action beyond what they could bear; it is increasing the *size* of the vessels, but not their *action*. It is the opinion of some persons even at the present day, that the motion of the *blood* is *accelerated* in inflamed parts, though the experiments of PARRY and others prove the *contrary* to be the case, as follows from the *capillaries* being *enlarged*, inasmuch as when fluid passes through a given space, the current beyond that will be slower in proportion to the wideness of the channel, as every one must have observed in a wide part of a river, where the current becomes slower; and the same may be observed by passing water mixed with grains of amber through a glass tube with a bulbous enlargement in the middle, the current will slacken in the bulb and resume its velocity beyond it.

Some will allow that the capillary arteries where the blush of inflammation is are weak, as they visibly have given way, but they still talk of *increased arterial action*, and say that the arteries *around* or leading to the inflamed part are in increased activity, as a part of the condition or what keeps up the inflammation; not considering that an increase in their action would be contraction, and so a diminution of the flow of blood to the inflamed part; wherefore an increased action in the arteries both in and leading to the inflamed part is just what is required to diminish the inflammation.

The more the heart acts the more of course it forces the arteries of the inflamed part and the *pulse* shewing the degree of power of *action* of the *heart* is erroneously by some considered as an evidence of arterial action, as the throbbing of the carotid arteries for instance; the heart then acting against the capillaries, if we cannot get them to act strongly enough to resist its force we are obliged to diminish the force of the circulation, either by taking away blood which diminishes both the quantity of blood sent to the arteries and the action of the heart itself, and in this way we leave less for the arteries of the inflamed part to do; or, we can lower the force of the heart by medicines, such as digitalis, &c.; here for illustration the simplest cases of inflammation have been taken, where the heart is acting naturally the inflammation being from injury.

Sometimes parts are loaded with blood when we cannot find evidence of inflammation, and which state is called congestion; inflammation or congestion are but varieties of distended vessels, which, if they cannot unload themselves we assist, by applications or medi-

cines which make them increase their contractile action, or if that alone is not sufficient, by taking off some of the force which injects them, or as it is called the vis a tergo.

The difference between CONGESTION and inflammation is that in congestion there is mere distention of vessels, in inflammation there is more or less alteration of tissue, connected generally with deposition in some way of coagulable lymph; the moment congestion is relieved the parts are in their natural state, but even after inflamed vessels are unloaded there is time required for recovering their natural state; a good example is the congestion of the lungs in fevers, which often leaves no symptom when the fever is relieved, but after inflammation of the lungs has been stopped they require time to regain their natural state.

I take this opportunity of acknowledging our obligations to LÆNNEC; any man who has practised for some years (as I did) before the introduction of auscultation, and judged of the difficulty of pulmonary diagnosis, will be able to estimate the blessing it confers, by enabling us to distinguish the varieties of affections of the chest. Compared with what we now know of diseases of the viscera in the chest the sum of information attained twenty years ago was but darkness visible; it appears ungenerous to detract from Lænnec by saying he has not assisted us much in prescribing, he has done every thing in assisting us to distinguish the disease, the application of remedies depends upon our own skill afterwards; as for any objection to auscultation, I have never known any one who understands it who is not glad to avail himself of it.

The stethoscope which was likewise his invention, is an admirable contrivance to enable the physician to hear the sounds in the chest without applying the ear to it, either when the feelings of a female patient may oppose, or when the patient is in a state disagreeable to the physician; it is like the metal tube in a house for communicating sounds at a distance, the stethoscope enables the medical man to obtain the requisite information, and at the same time keep his distance.

Let us see how far we can go, in proving that the *capillaries depend* upon *nervous influence* for their contractile *action*. In the first place, blushing is perhaps the most unequivocal proof of the nerves being the cause of sudden dilatation of the capillaries. It is not the action of the heart alone which causes the partial flush, for first the heart often acts stronger without causing blushing, and next the blush is partial, whereas when the mere action of the heart causes increased redness of the skin it is not partial, as it is in blushing, from mental emotion.

What is called the blush of inflammation, may be brought on in a part by reiterated strong electric sparks; it may be said that the effect of the electricity is on the tissue of the capillaries, but the first effect produced is pain, showing that the operation of the electricity commences on the nerves; the same observations are applicable to the blush produced by heat from a fire, and we have a proof that this is the effect of nervous influence before injury or alteration of the structure of the vessels, by the common experiment of those who have resolution to hold the burned or scalded part to the fire and remove it gradually, which will prevent the

disorganisation that would otherwise take place, in common language prevents blistering; the mischief is caused by exhaustion of the nervous influences, the sudden removal of the excitant leaves the capillaries destitute, and they *yield* immediately to the *ordinary injecting force*, but if the excitation is renewed by holding the part to the fire nervous influence is supplied from the neighbouring parts to the capillaries, with pain certainly, but by gradually removing from the heat the nervous influence will be gradually supplied, till the excitant be reduced to a natural standard, relieving the pain and incipient inflammation, this I consider to be a proof that the diminution of nervous influence rather than alteration of tissue is the proximate cause of the relaxation of the capillaries, for if it were alteration of the tissue not diminution of tone, the renewal of the heat would add to the previous mischief instead of relieving.

The *progress* of inflammation shews the dependance of the capillaries on the nerves, a part may in certain cases be observed to become tender before it is red, for it may be seen by experiment that the pleura or peritoneum of an animal is not tender immediately on exposure, it first becomes tender and then red. The action of cantharides in producing inflammation is another proof that inflammation begins in the nerve, for cantharides have no effect on the tissue of the capillaries, do not corrode or act in any way on their substance after death, when the nerves have no influence, whereas any really corrosive agent would act even more on the dead, than on the living capillaries; without at present seeking for further proofs, I deduce from blushing, and

from the effect of electricity, fire, and cantharides, that the capillaries depend upon the nervous system for that tone or energy which preserves them from over distention. And the brain and nerves again depend upon the due nutrition by the arteries supplying them with scarlet blood.

Though Bichat denies the influence of the nerves, or says that it is almost nothing, in secretion, exhalation, &c., I consider that their sudden alterations from mental emotion proves the contrary, independent of the proofs already advanced that capillaries which are the agents of these functions derive energy from the nerves.

It is sometimes remarked that local irritation *detains* the blood in a part which may be explained by the increased capacity of the vessels causing a slower current as before stated; besides this expression and the terms, congestion and inflammation, there is another word, DETERMINATION, used to express an habitual reception of more blood than natural in a part, as "determination of blood to the head with throbbing of the carotids," the throbbing of the carotids has been already explained not to be active but passive; now the word determination in ordinary language implies that blood is sent there in particular but the heart has no power to direct any blood to one part more than another, although if in any part there is an unusual relaxation of the vessels, they will receive more than usual; as, when the water is sent through the great pipe of one of the water works it cannot be determined to any house in particular but which ever house has the largest cistern will receive most water, by this I wish merely to illustrate, that, what is called determi-

nation is not active but passive, the term also used by Bichat of the blood being drawn or invited into an inflamed part may be explained on the same principles.

Irritation of the nerves of a part at last produces inflammation by exhausting that nervous influence which gives the capillaries power, they thus become weakened, allow of over distension, and the part is in the state of inflammation or congestion; this effect may be produced by electricity which acts palpably through the medium of the nerves, so that redness produced in this way is as evidently through the medium of nervous influence as blushing.

Thus in a part inflamed, there is a diminution of organic action, in consequence of which the blood is admitted in excess; as long as the capillaries are supplied with nervous influence, as long as they possess perfect organic action, they preserve a due size; when they lose it, either from the influence not being supplied from the nervous system, or are robbed of it by heat, electricity, cantharides, or other cause, they give way and admit more blood than before.

This leads to an *explanation* of the *diminution* of SECRETION in an organ at a time when it is in fact more full of that material, (the blood) from which it secretes, than ordinary, as the kidneys, the skin, &c., and enables us to account for the dryness of skin, and scanty secretion of the kidneys in fever, &c., without reference to Cullen's doctrine of spasm, but on the contrary from an increase in diameter of the capillaries, not from obstruction, but on the contrary too much room.

Secretions are carried on by fine capillaries which

diminish gradually in size until they admit only one red particle at a time, and still smaller ones only serum, from which the perspiration of the skin, and secretion of the kidneys are separated, but it must be recollected that in this series of diminution, the larger capillaries do not terminate merely in the smaller, but that there are lateral communications besides with the veins, so that whatever of the blood is not secreted is returned, and it does not follow that where there is diminished secretion, there is obstruction, on the contrary there may be more space for the flow but then in a slower stream, for, as has been shewn, the consequence of enlargement of the capillaries of a part is that the flow of blood will be slower in them, for the supplying arteries remaining the same, the larger the capillaries supplied by these branches the slower the flow will be in those capillaries, consequently there will be a diminution of the current into the minute capillaries which secrete, as those of the skin, kidneys, &c. hence to account for the diminished secretion it is not necessary to suppose either any spasm or error loci of the red particles getting into the colourless capillaries, it is enough to consider that the fluid finds an easier way by the enlarged lateral capillaries into the veins instead of being confined and pushed on into the ultimate secretory terminations; this accounts for one kind of dimished secretion, where the heart is not deficient in injecting power, but the relaxation of the capillaries from want of nervous energy produces a deficiency in the current of the blood, as in a dry skin when inflamed or feverish, or kidneys inflamed, or their capillaries enlarged by cantharides so as to diminish secretion as just explained;

again, without local enlargement we may have secretions diminished merely by failure of injecting power of the heart, as we see in typhus, still without resorting to spasm for explanation. But it may be required to account for the increased secretion which takes place sometimes with this weak pulse, the reason is, that though the circulation is weak, the capillaries are so deficient in nervous energy that they become patulous, as when there is colliquative sweat, and encreased flow from the kidneys with weak pulse, but the secretions in this case are very unlike those of health.

Thus we can account for suppression of secretion (without attributing it to error loci or spasm) merely by the capillaries not having power from enlargement from weakness to pass the blood or serum to the secretory structures, in consequence of which the blood will return by the veins without secretion; but if by cold, as when it is applied to the loins, or by astringents we cause a contraction of the capillaries, or by taking off the injecting force by venesection we relieve them so as to allow them to contract they renew their secretion. All secretion is by capillaries, and we can conceive that by the secreting capillaries of one organ being longer than those of another a very different secretion may be formed in consequence of a greater length of time being allowed for the operation of the nervous influence.

The healthy operations of the arteries have been mentioned so far as their continued and gradual deposition of matter in its various modifications, from solid bone, to gaseous exhalation, their depositions are very gradual, in proportion to the whole quantity of blood passing through the arteries, a great portion of which returns

by the veins unchanged, or at least unconsumed, so that there is always an abundant overplus for the demands of the system, and this provides against accidental or artificial loss of blood.

Whilst the processes described go on, the animal suffers no inconvenience, is in health, but when accidental mechanical injury or other cause changes the action of the capillaries, either by a direct impression on themselves, or by primarily injuring their nerves, the derangement of their action is the commencement of disease; secretions become altered, checked, or profuse; nutrition is either diminished so as to produce emaciation or there is an excessive deposition; vapory exhalations are diminished to dryness or encreased to fluid, bony particles are deposited in wrong places, or albuminous, fatty, and other particles, so as to constitute tumours; the nerves of parts become morbidly sensible so as to derange the functions of those parts; portions losing their vitality undergo spontaneous decomposition and are removed by the absorbents.

To explain this more in detail, every process of DISEASE is the result of some *alteration* of those *actions*, which when perfect, constitute the *welfare* of the animal, and in some instances by a provision of nature the newly altered action, which is the consequence of the injury, repairs the damage without assistance from art; for instance, the tubes which conduct the air through the lungs are under ordinary circumstances scarcely moist, but if particles of dust or insects get in, the irritation causes the production of mucus which entangles the foreign substance and so brings it away with cough.

We also see where a part is cut, the minute arteries

which carry albumen and *coagulable lymph* allow enough of it to pass and to glue and unite the surfaces, if kept quietly in contact which is called technically union by the FIRST INTENTION. When blood is allowed to stand in a vessel, we see on the top of the clot of red particles which settle down from the serum, a layer of a yellowish white substance like paste; this part of the blood is the coagulable lymph which it carries in readiness to repair damages, yet this same coagulable lymph which is so useful for that purpose sometimes kills by blocking up the wind pipe, in croup.

Hunter has pointed out the close analogy between inflammation and the formation of the first lining membrane of the gravid uterus.

Now if the union by first intention be prevented by disturbance, it becomes necessary that the surfaces should be reunited by the interposition of a new substance forming a connecting medium, for this purpose small drops of coagulable lymph are exuded which concrete, remaining at the cut ends of the capillary arterial branches which have yielded them, and in communication with these open ends, so as to receive nourishment and become organised; these little portions of coagulable lymph are called GRANULATIONS, and if they are not much disturbed they adhere to each other, and thus the cementing of the divided parts is effected; in order to protect these new tender granulations they are covered with *pus*, a milky thick fluid which when of a due consistency is very properly called healthy pus, for it requires a healthy action of the capillaries to produce it in proper quantity and of due consistency; if pus did not defend the granulations from the air, they

would dry, and become scabs instead of uniting and repairing the parts, if the secretion be too thin they become either spongy granulations and weak, or none are formed; an ulcer which whilst healing appears a large ugly sore to the inexperienced eye, is called by the surgeon a fine healthy granulating surface and to obtain this healthy process often requires the exercise of much skill both in local and constitutional remedies, as for instance, to heal an ulcer, or a stump or other part after operation, and this is sufficient example of the necessity for a surgeon's being well acquainted with the use of constitutional remedies, and the most dexterous surgeon after performing an operation, may be glad of the assistance of the physician to relieve subsequent constitutional symptoms.

Many persons of great experience practise well empirically without much brains or reasoning, but he who begins upon principle, and then profits by experience, must be a much more skilful practitioner. How many persons apply a poultice to an ulcer with a tolerable certainty of improving it, without ever knowing or caring for the rationale of the effect. Studying the operations of nature leads us to imitate by analogy; independent of the regulation of temperature the usual benefit derived from a POULTICE, is that of preventing premature scabbing by the soft moisture assisting the pus to protect the granulations, the German WATER DRESSING has much the advantage over the poultice, the piece of lint dipped in water is lighter than the poultice, and the oiled silk over all retains the moisture and the whole does not spoil the sound skin as the poultice often does. If poultices be applied too long, they de-

bilitate the part, and the granulations become weak and spongy, or what is called proud flesh forms, these spongy granulations may be checked either by applying an ASTRINGENT, such as vinegar with the poultice, or by nitrate of silver, or sulphate of copper &c. which by constringing the vessels give a firmer smaller granulation, or by merely laying on a bit of DRY LINT it absorbs the coagulable lymph as fast as thrown out so as to stop granulation, which accounts for dry lint preventing the healing of some ulcers, and assisting others according as the granulations require repressing or not, and what has been here stated affords an explanation of why in some cases dressings should be changed frequently in other cases as seldom as possible.

BAYNTON's strapping unites the advantages of keeping the granulations moist with SUPPORT, but if injudiciously applied injury is done by pressure &c. MR. J. SCOTT has clearly pointed out the *difference* practically between *support* and *pressure*, weakened vessels want support, but cannot bear pressure. I have above used the term *premature* scabbing, because the crust formed is sometimes of use.

The application of dry lint will be enough without an astringent if the proud flesh be merely too great a growth of healthy granulations caused by keeping on the poultice too long, but if the granulations are also weak the astringent will be necessary; this weakness may be known by a livid colour and thin instead of creamy pus, and if still weaker the granulations will even melt away and the ulcer deepen again and spread. Now an inexperienced person would suppose that the application of nitrate of silver, (lunar caustic) or vinegar

would increase the pain but it is well known that though they produce momentary smarting especially if applied undiluted this soon subsides, so that a person will fall asleep shortly after the application of nitrate of silver to an ulcer which has banished rest for several days and nights by its irritable state; the irritable state depending upon the circumstance that the nerves of the part have become inflamed, their vessels partaking of the debilitated state of those around them; the astringent diminishes the inflammation in the nerves and thus removes their morbid sensibility, bringing them to the state of the nerves in a healthy granulating part in which those below the granulations are sensitive but not irritable. Oil of turpentine applied to a burn acts on the same principle. This will illustrate the nature of IRRITATION; healthy inflammation is not combined with irritation, the nerves not being implicated, but morbid inflammation involves the nerves. There may be a considerable degree of pain in healthy inflammation from injury, when the healthy nerves are exposed and hurt, but there will be more annoyance and loss of sleep with less pain when from the nerves themselves becoming inflamed there is irritation of the nervous system, which may be local or constitutional, requiring thereby merely local, or local and constitutional remedies together, as will be explained hereafter.

On the MUCOUS SURFACES the change is very rapid from health to disease; by a slight alteration of the action of the capillary arteries which secrete a mild fluid to lubricate and prevent irritation, the surface becomes either dry or an ichorous fluid is poured out which so far from protecting the parts irritates them, and others

with which it comes in contact; or coagulable lymph oozes from the capillaries and concretes, forming what are called FALSE MEMBRANES sometimes blocking up the passages of mucous surfaces; and this same exudation on SEROUS SURFACES causes ADHESIONS; sometimes the capillary exhalants are so altered as to allow blood to ooze from them, which fact it is necessary to remember to account for the appearance of blood where no rupture of any blood vessel has taken place, as happens in HŒMORRAGE from the bowels or other parts.

When a part receives a blow of sufficient force there is an extravasation from the capillary arteries of blood, or of lymph, which causes swelling of the part, but is in process of time absorbed and carried off by the lymphatics.

In this instance healthy capillaries are compelled by force to allow their contents to escape, which are gradually taken out of the way by the absorbents; in disease the process is similar, in erysipelas, lymph and serum are effused, causing swelling which is gradually absorbed as the patient recovers; in dropsy nearly the same takes place.

Blows are frequently of more serious consequence than just stated; if very severe the life of the part may be destroyed, and the dead animal matter becoming fluid by decomposition is removed by the absorbents, in other words an ULCERATION takes place and the part will be gradually repaired by granulations.

Sometimes TUMOURS are formed in consequence of blows, coagulable lymph being effused which becomes by a process similar to granulation vascular and organised (possessed of vitality) a part of the animal, and

not removable by the absorbents which only take up unorganised or dead matter; sometimes these tumours remain unaltered, others by their presence cause an irritation which makes the capillaries go on depositing more and more, and so adding to the tumour which thereby is increased till it is removed by operation or exhausts the animal and destroys life. Now as was mentioned in other cases, that which arises here in consequence of accidental injury sometimes also takes place as the effect of disease, tumours form spontaneously either with or without feverish accompaniment and sometimes disappear again by what is called resolution, that is, cessation of the inflammation and subsequent absorption, sometimes they suppurate forming abscess, sometimes remain indolent, sometimes they remain and grow larger, sometimes grow larger and ulcerate at the same time as in cancerous and other malignant diseases. Tumours are modified by the part they occupy and the constitution of the person, if the substance injured be fat the arteries being depositors of fat make a fatty tumor, if it be periosteum, bony, if gland, glandular, if a vascular part, a vascular tumor, which in a bad constitution will become FUNGUS HŒMATODES, as a tumor of a secreting gland in a bad constitution will become CANCEROUS, and in a lymphatic gland SCROPHULOUS, besides peculiar matters medullary sarcoma, &c., which are deposited in a variety of situations; the tough bands which traverse fatty and other tumors are made by arteries which in a healthy state would have to support membranous, cellular, or ligamentous tissues. If the absorbents cannot take up matter which is organised it may be asked how they get away tumors; the or-

ganisation of a tumor is but imperfect and it is a burden on the previously existing arteries in addition to their originally allotted task, if these arteries have been enlarged in size (for we know arteries can grow larger) by the inflammation which organised the tumor, they will go on to support it, but if they have only been dilated, they will when the inflammation subsides resume their natural size and starve the tumor, the constituents of which will when thus deprived of support return to the state of lymph, &c., which being unorganised are thus amenable to the absorbents; on the other hand the tumor may have been too well organised to give way, and so continue an *indolent* life at the expense of the surrounding parts after all inflammation has subsided, but producing neither pain or inconvenience, unless a blow or other cause renew inflammation. Now if the efforts of nature do not remove the tumor we have remedial means of starving it.

1. The simplest by pressure keeping nourishment from entering its vessels, as when a piece of sheet lead is bound down upon it, &c.

2. Cold will cause vessels to shrink, as cold lotions, &c. constantly applied where pressure could not be borne on account of its producing pain.

3. Pressure so gentle as *not* to *compress* but merely by affording *support* to inflamed and distended vessels, first to stop the inflammation after which stronger pressure may be resorted to if necessary without its producing pain.

4. Daily or at least often repeated abstraction of blood by leeches, &c from the part, taking care not to undermine the constitution by taking too much.

5. Artificial discharge with counter irritation as by issues, blisters, the tartaric emetic and iodine ointments, &c.

6 By medicines which have an effect on the arteries themselves directly or through their nerves, so as to make the inflamed capillaries contract, (independant of the vis a tergo or state of hearts action or quantity of circulating fluid,) for this may be necessary even when the circulation is very weak, as in some cases inflammation goes on with a most debilitated constitution and weak pulse, it is only the debility approaching to a dying state that will prevent a blister from rising when the poison of cantharides has relaxed the vessels, hence it is plain that it must be an enormous loss of blood which could prevent a blister from rising, shewing that the proximate cause of the inflammation is in the vessels of the part and not in the injecting force, and this will explain to the pupil who has seen how much venesection has relieved inflammation from fractured ribs, that he cannot always "knock down" inflammation by venesection alone, though free venesection in the beginning is of the utmost consequence, and again we are by no means to draw the conclusion that an affection is not inflammatory merely because it does not yield to depletion, what degree of depletion would remove a node, or syphilitic iritis, without mercurial medicine, what would venesection do for rheumatic pains without antimony, colchicum, bark, mercury, and other medicines; I believe that mercury removes morbid growths by starving them by contracting the capillaries, and not by increasing absorption as is a commonly received opinion; it may be said that the swelling of the gums

and fauces from mercury is a contradiction of their being starved, but though swelled they are worse nourished, are spongy, weak, soft, as a limb may be swelled by dropsy, though actually emaciated as to its natural substance, another apparent objection to this idea of starvation is that mercury stops ulceration, but in many of our medical explanations we appear to "blow hot and cold," it stops ulceration for the same reason in one case, that it produces it in another, it contracts the capillaries; so that a healthy part is ulcerated by what contracts its nutrient capillaries *from* a natural state, an unhealthy ulcer is stopped by what contracts its relaxed capillaries *to* a natural state. But this term contraction of the nutrient vessels does not quite express the cause of the sponginess of the gums, because there is really inflammation, relaxation, which is the *secondary* result of the contraction, the excessive contraction occasioning the loss of contractility, that is, over action of the remedy causing at last a loss of power, as cold, which at first contracts, will at last destroy the power of the capillaries, so that relaxation, that is inflammation (chilblain) takes place; as we see in a variety of instances that a remedial agent too long or too powerfully applied becomes noxious by exhausting the vitality, in fact wearing out or straining the machinery of the organ, so that it can no longer answer to the nervous influence, whether the organ be capillary tube or any other structure, and it remains for us still to investigate what part of the machinery is injured the contractile or nervous fibres.

But even granting that syphilis or ague might be cured by starvation, abstraction of blood, and other

general means, and supposing itch were curable thus instead of by sulphur, the question is not so much as to possibility, as to expedition, and safety to the constitution; what degree of depletion would cure rheumatism which gives way to doses of colchicum too small to cause any sensible evacuation, just as, small doses of arsenic will cure cutaneous inflammation that could not be affected by bleeding or other depletion; we cannot in the present state of our knowledge account for the specific effects of remedies such as mercury, arsenic, colchicum, &c., though we may perhaps by careful investigation arrive at it in time; we can understand thus far, that the serous membranes and cellular tissue and skin which are very vascular, under common inflammation run a rapid course of disease, and are relievable by active means, but when the structures are attacked by specific inflammation, (which being produced by a morbid poison is slow in its progress,) or when the tissue inflamed is one of dense structure with very minute capillaries, depletion has no effect to reach the capillaries, and we are obliged to resort to specific medicines, as mercury, arsenic, sulphur, &c. Now what degree of depletion would cure itch, or stop small pox, or other inflammation produced by poisonous substances, one unknown morbid poison taken into the system will bring out painful blisters (shingles) resembling the blisters of cantharides and which like them will heal of themselves, another morbid poison will bring out the pustules of small pox (variola) which resembles those produced by tartar emetic, and which like them also heal of themselves, or if medicine be necessary it is to mitigate the constitutional or febrile

symptoms, the local inflammation must have its course. The poison of varicella (chicken pox) brings out vesicular pimples like the mercurial rash which disappear spontaneously.

The effect of the poison of some kinds of shell fish will be head-ache, prostration of strength, nausea, restlessness followed by a swelling of the face with bright redness and itchiness of the skin, phenomena similar to those produced by the morbid poison of scarlatina. We must in every one of these cases refer to the nerves as the proximate cause acting on the vessels, as in some the eruption subsides rapidly, leaving no trace of alteration of structure, and the itchiness or pain show that it is the nerves which are affected primarily if not solely. We cannot decide when shell fish or acidity in the stomach produces nettle rash, whether there is actually something circulated to the areolæ of the skin to cause the capillaries to give way and swell, or whether the effect be produced merely by the nerves of the skin being continuous with those of the stomach, analogy would lead us to conclude that there was something circulated which poisoned the nerves of the spots, a similar effect being produced on a part by the sting of a wasp, or a nettle, or the bite of a gnat, all which introduce a poison; for the puncture of a clean thorn or needle does not occasion the weals, hence I think the EXANTHEMATA are produced by poisonous effluvia absorbed and circulated.

Nervous influence is *elicited* in producing *nervous actions* such as perceptions or thoughts, *organic actions* such as those of capillaries, heart or intestines, or the *combination* of *nervous* and *organic action* voluntary

motion, if this expenditure exceed the supply or secretion by the cineritious part of the nervous system, exhaustion is evinced in various ways, in health by sleep, in disease by delirium, stupor, or death. The heat of fire produces a sensation, first of pleasure, then if increased, of pain, this elicitation of the nervous influence does no harm if the person be in health, because it is kept up by the apparatus of the brain and nervous system which generates it, but if the person be feverish, the nervous system out of order, the sitting close to the fire adds to the exhaustion and debility, nay even in health a lazy indulgence, codling one-self as it is called over the fire produces languor, and other indulgence of nervous sensation produces debility, "balnea vinum &c."

To judge by the phenomena, alcohol produces sensation by calling forth nervous influence, its action like that of fire exciting a quicker extrication of nervous influence, here again, whilst there is health so that the nervous influence is renewed, no harm is done, but according to the constitution the abuse of wine or spirit produces sooner or later an exhaustion, and the result is a feverish or irritable state, a state of fatigue analogous to that occasioned by bodily fatigue, which is the state produced by expenditure of nervous influence, by the successive discharge of it into the muscles, to keep up their action in walking or laborious exercise. Sleep is a *cessation* of that expenditure of nervous influence which takes place in *nervous action, organic action continuing;* the first evidence, in waking, (stretching) is of accumulated nervous influence. The expenditure of nervous influence going on under ordinary

circumstances quicker than the generation of it a periodical return of sleep is induced.

It is necessary here to mention the distinction between *sedatives*, *stimulants*, *tonics*, and *narcotics*, a great confusion of language and ideas having prevailed on these subjects, as for instance, any medicine which made a person better without evident effect on the bowels, kidneys, &c. was called a tonic and in so much as it restored tone to the system undoubtedly had a tonic effect, now this is the case so often with wine in debilitated habits that it is no wonder stimulants and tonics became almost synonymous, and the common mode formerly of administering bark in port wine increased the error, and bark was thought stimulant; we have a difficulty too in distinguishing qualities of medicines from many of them having two principles combined, as will be pointed out directly; we may however get very nearly pure examples of each, stimulant, sedative, narcotic, and tonic.

A STIMULANT is that which through the medium of of the nervous system increases the action of the heart and other organs, by calling forth the nervous influence or by facilitating the extrication of it in them, for example wine, brandy, and other spirits the product of fermentation.

A SEDATIVE is that which diminishes the action of the heart and other organs by repressing the nervous influence, for example digitalis, and green tea which though called a stimulant by some, was shown by Dr. E. Perceval to have an effect similiar with digitalis, green tea in excess produces a sense of anxiety and oppression

of the chest with intermitting weak pulse, nausea, &c. I acknowledge that the NEW ITALIAN DOCTRINE OF MEDICINE has given us more definite ideas on this subject, and the practice of that school elucidated the properties of remedies; they use the word *stimulant* as we do, but they have discarded the word *sedative* on account of its being *confounded* with *narcotic*, &c. I think I have drawn the distinction clearly without adopting their new term of CONTRASTIMULANT, which seems unnecessary, if sedative be separated from narcotic, their term *contrastimulant* however is good as it can never be mistaken.

It has been often asserted that there is no such thing as a direct sedative or allayer of action, but that the sedative effect was only the result of exhaustion from stimulus, arguing from the stupid state which comes on in intoxication from fermented liquors, and from opium, which is observed to be stimulant in small quantities before enough is taken to produce stupor. In the first instance the brandy produces stupor in reality by excess of stimulus exhausting nervous influence, and perception of the brain, as looking at the sun will take away the power of the optic nerves by excess of stimulus and too great noise will cause temporary deafness;

The case is different with opium, for opium contains two principles the stimulant and the narcotic, this is not now matter of speculation because they have been separated chemically and the narcotic part can be used to produce sleep without the stimulant; the stupor from opium was said to be the sedative effect subsequent to, or produced by the exhaustion of the stimulus, but this is not the case for the stimulant part being taken

away, the narcotic part produces the sleep just as certainly. It having been also observed that a state of exhaustion succeeds intoxication or any other abuse of stimulus, it became thus adopted as an axiom by many that there could be no sedative effect but secondary as the result of previous excitement, and I have found many who endeavoured to prove that digitalis first produces a stimulant effect, the only apparently good argument in my opinion that they could bring forward is, that digitalis sometimes makes the pulse quicker than it was before, but I answer that every person who has bled a few patients must have observed the pulse to get quicker as the patient becomes faint, I say then the increased frequency of the pulse is no proof, as no person will call blood letting to syncope a stimulant. It may however be advanced that in inflammatory complaints the pulse will become not only more frequent but harder, that is in fact stronger whilst the patient is taking digitalis, but that is not owing to the digitalis; when the patient does not get enough, a few drops only being administered at each dose or if bleeding and other remedies be neglected, or the inflammation be not controlable by any means (even in the most skilful hands), the inflammation increasing the pulse becomes harder, but this is not the effect of digitalis any more than venesection. Every practitioner of experience must have found the pulse get *harder after a bleeding*, (which has not been sufficient to subdue the inflammation,) until *another bleeding* has *softened* it; no doubt *digitalis* as well as *venesection* may *raise* the *pulse* when it has been *sunk by inflammation* below the natural standard as will be explained hereafter. We should

beware of attributing to the remedies, the changes of pulse which depend on the progress of the disease.

A *stimulant* increases the action of the heart and consequently for a time sending more arterial blood to the brain, (besides its own effect on the brain when conveyed through the circulation) excites the sensorium to hilarity, (if there be no latent disease there) but in too great a quantity produces stupor.

A direct *sedative* diminishes the action of the heart and nervous system, in excess, instead of hilarity producing anxiety, depression and despondency, nay more, allaying action in the nervous system, so that it cannot direct the muscles, the patient becomes giddy and staggers, and even the retina becomes so weak as not to see distinctly, so that a person may reel or see double without being drunk and this likewise occurs from loss of blood. It is well for the student to be early aware that opposite states may thus produce similar appearances, though the remedy which would relieve one would not afford relief to the other, for instance the coma of children which proceeds from inanition, and which might be mistaken for a plethoric state of the internal vessels, is relieved by stimulants, as is so well described by GOOCH, and the disease called DELIRIUM TREMENS has many symptoms in common with those complaints which are cured by venesection and sedatives, but which itself requires stimulants either alone or combined with narcotics.

Stimulants produce stupor or confusion of ideas by overpowering the brain with arterial blood, from the *increased action* of the *heart* which they occasion, for

though arterial blood is the source from which the capillaries of the brain prepare or secrete the nervous influence, *over-injection* diminishes secretion (as in the kidneys, &c.), but mere increased action of the heart is not sufficient to produce the over-injection, the *stimulant* itself being circulated to the brain at the same time, *expends* by its action on it, the *nervous influence* which it meets with there, besides that it interferes with the generation of more, so that the capillaries from the exhaustion of nervous influence become more *distensible;* the proximate cause then of *coma* from *stimulants* is *congestion*, or *plethora.*

Sedatives on the contrary *diminish* the *injection* of the brain, at the same time *repressing* the *nervous influence*, so that the proximate cause of *coma* from *sedatives*, is *inanition.*

This will explain one cause of the confusion of terms, sedatives are sometimes miscalled stimulants when they relieve the coma of stimulants, or the drowsiness of fatigue, or other plethora, because this relief is called rousing or awakening; as by tobacco-snuff, digitalis, green tea. A stimulant, wine, given to a person fatigued produces sleep.

By the term *sedative* is *not* to be understood a *putting to sleep*, but whatever has for a time the effect upon the nervous system as if it had been refreshed by sleep, for by checking the expenditure of nervous influence in the organs, there is more of it left at the disposal of the brain, but this of course has not the restorative effect of sleep (which does not diminish the supply of arterial blood to the brain by checking the action of the heart),

on the contrary, though the ideas are rendered free at first, exhaustion will at length produce the coma of inanition.

The expenditure of nervous influence in one part usually diminishes it in others, fatigue from labour includes a certain exertion of the brain in the production of voluntary motion, but if the body and mind be fatigued at the same time, as when a person has to walk much and at the same time the mind is anxiously occupied, the expenditure of the nervous influence will be more rapid, and the exhaustion likewise; again the expenditure of nervous influence in intense study or professional business, especially if anxiety be combined, withdraws so much of the nervous influence as to diminish the energy of the digestive organs, and on the other hand it is well known that excessive feeding diminishes the energy of the mind; the cares of business disturbing the energy of the digestive organs is the fruitful source of indigestion and gout, particularly if, as in great cities, perpetual feasting add to the labours of the stomach.

Again, we see the expenditure of nervous influence in one part exhausting it in another, when, digestion diminishing the energy of the brain, persons become drowsy, and, diminishing the nervous influence of the skin, produces chilliness. We see that when nervous influence is expended to the degree that ordinarily induces sleep or the suspension of sensorial action, this suspension is retarded if any irritation produces a renewal of sensations, as the pain of tooth-ache, or if the extra stimulus of anxiety (in cases of affection or interest), continue to occasion extrication of nervous influence, and this power of continuing cerebral action,

(wakefulness), will be increased by introducing into the stomach a contrastimulant, such as digitalis, or green tea, which by diminishing the expenditure of nervous influence in the primæ viæ and heart, leaves a balance in favour of the brain; but observe, this is forcing the natural powers, and the consequence is that the expenditure of nervous influence still going on with diminution of the power of the heart and primæ viæ, the brain will become weaker, and though thoughts may be excited they will be vague, and false perceptions will arise, which state is called being nervous and is felt by those who have sat up late watching the sick, or reading, and having forcibly kept themselves awake either with or without tea, coffee, or snuff, become chilly, starting at any noise, and with involuntary apprehensions of danger contrary to reason; if persons under these circumstances lie down in a cold bed they will frequently not get to sleep, the current of nervous influence being still directed to the brain, but a warm bed by diverting the influence to the nerves of the skin from the brain, leaves it to repose; and wine or spirit, or even hot water, taken into the stomach will produce the same effect.

One example more of a direct sedative, a common dose of salts if it operates makes a person pale and cooler in body and mind, there is nothing stimulant in this, but it is not a simple sedative as it is an evacuant, I only say it is not a stimulant, I have heard emetics called stimulants but I cannot agree to this until I see a good dose of ipecacuanha, or tartar emetic make a person feel warm and cheerful and their pulse stronger while they are sick.

Tonics are those substances neither immediately calling forth nor repressing actions, but giving power to the nervous system to generate or secrete the nervous influence, in other words making the nervous system stronger, by which the powers of the whole frame are increased, but doing so without any evident phenomena of immediate excitement as by stimulants or of repression as by sedatives. The action of tonics (which can be traced to their effect specifically on the nervous system) is gradual, if therefore there be any sudden alteration of the pulse immediately after their administration, it must not be attributed to them, as the pulse will vary according to the progress of the disease, as affected by the use or neglect of other remedies, for either the advance of inflammations, or the neglect of other remedies, or the administration of stimulants with tonics, will occasion that hardness of pulse which has usually hitherto been supposed the effect of a stimulant property in the tonic.

We have proof enough of the effect of quinine, iron, and arsenic, being direct on the nerves, in neuralgia, &c. There is a palpable analogy between the action of nitrate of silver, sulphate of copper, arsenic, &c. on sores, and their effect on the constitution when introduced through the circulating fluids; in either case if used in too great quantity they will do harm, externally instead of constringing and healing they prove caustic, also internally too much is poisonous, but bark or carbonate of iron which do not produce chemical decomposition are free from the risk of acting as caustics, or poisons. Some tonics then, in excess, as well as stimulants and sedatives become poisonous. Arsenic pro-

duces inflammation as a poison, but this is not to be referred to when considering the tonic effect of small doses of the mineral, the tonic effect being a modification of vital actions, the caustic or poisonous effect a destruction of the machinery; there is no analogy between the disease which the tonic cures and the diseased state produced by the caustic poison.

Therapeutics and toxicology require very different modes of investigation, and notwithstanding that experiments which have been made with poisons are very interesting and useful for the purpose of finding antidotes, they do not advance us much in reasoning upon the remedial use of the same substances.

The tonic property is often combined with astringency, but that they are not identical is evident from quinine or cinchona bark being tonic, tannin or oak bark not.

Stimulants by temporarily exciting the nervous system when weak in some cases give the digestive organs more power for the moment, the new nourishment increases the strength of nerve as well as other parts, and thus stimulants and generous diet become in reality a part of the tonic plan, and from stimulants being so often administered with tonics, tonics have been thought stimulant, it is of the utmost consequence to know that they are not, otherwise there may be a fear of using them where they would be very beneficial along with evacuants and sedatives, for full doses of quinine may be beneficially used along with digitalis and bleeding on the one hand, or with wine on the other.

Every practitioner acknowledges and recollects the benefits derived from tonics combined with stimulants,

but they may find examples also of their good effects combined with depletion, for instance, it is well known that ague attacks the most opposite constitutions, and that many require support, and on the contrary many require venesection, opening medicines, and emetics, with bark or arsenic to cure it. Many medical men are so strongly imbued with the idea of bark being stimulant, that they prepare the patient as they call it by using the antiphlogistic treatment before they venture to begin the tonic, but practical experience disproved the necessity of this long ago, and few now spend time in unnecessary preparation by other medicine, or bleed unnecessarily, but only when the state of the pulse &c. indicate the propriety of so doing. Tonics then being neither stimulant nor sedative may be usefully combined with either, for whether we want to keep down the pulse in inflammation, or to raise it and the appetite &c., in debility it must obviously be of use, if we can, to give tone and strength to the nervous system at the same time, because that tone and strength of the nervous system will not increase the action of the heart unless it is called forth by stimulants, observe the difference, tonics give strength, stimulants call it forth, a man may be very strong without putting forth his strength. Do not fear any danger from keeping the nervous system in good order by tonics, but beware of exciting over-action by stimulants when either inflammation or fever exists, stimulants excite action, but action is not strength, on the contrary we shall see when we come to consider fever, that action exhausts still more.

A correct understanding of these distinctions will be

found of great use. The constitution might sink under the depletion necessary to reduce inflammation if tone cannot be kept up, but this may be done without stimulation, many a time is the practitioner foiled by "pouring in the bark and wine," seeing the inflammation relighted he is obliged to leave off the stimulant, but as he includes the tonic under that head he leaves that off too, and so loses ground, or else knowing by experience that if he leave off the tonic the patient will sink certainly, he continues the two together at all hazards, till the inflammation and stimulus together destroy by fever.

With all it must not be imagined, as is too often the case with students, whenever a patient dies, that he might have been saved, they will be convinced by morbid anatomy, and experience, that many cases of disease are uncontrolable by human skill and means, but at the same time, seeing how much has been effected in fatal cases, will encourage them in steadily practising on rational principles. Tonics by imparting healthy energy to the capillary arteries have a beneficial effect on inflammation, even when bleeding and sedatives are necessary to keep down the action of the heart, but as long as the action of the heart is not below par the effect of stimulants would be injurious, except occasionally "for the stomachs sake." We know that inflammation sometimes degenerates, so that after the acute stage is subdued parts cannot heal when the constitution is sunk, hence the advantage of giving *tonics* to prevent this state as much as possible, (even whilst we are keeping down the pulse by bleeding,

sedatives, and cathartics,) if the constitution seem to require it, but by no means should we administer stimulants in the acute stage.

If tonics be not given in time, as they act but slowly, there may not be time to introduce them into the system when the acute stage is subdued, and there may not be sufficient strength for stimulants and food to work upon towards restoration. It is evident that tonics are distinct from stimulants and sedatives, from the circumstance that we cannot cure an ague or neuralgia by either stimulants or antiphlogistic treatment without tonics, we know that many slight cases of either will get well if left to nature, but I mean severe or obstinate cases.

The term tonic is applicable also to all those medicines which cure inflammation without being either stimulant, or directly sedative or depletory, commonly called antiphlogistic, and this will lead us to the rationale of tonics on the nervous system; there are various cases in which bleeding, cathartics, emetics, and other antiphlogistic remedies have not power to stop inflammation, and are yet wearing down the constitution, under these circumstances the great resource has been mercury, there are cases also in which arsenic, bark, opium, or other medicines are more applicable, but the great nostrum has been mercury, and yet though so useful in the most ignorant hands it is difficult to account for or denominate its action; it is often called a stimulant, and yet it cures inflammation when all stimulants are carefully withheld, and so coincides in its action with the sedatives, and might as justly be called a sedative, but it also cures inflammation in debilitated habits, when wine and other

stimulants are obliged to be given; I therefore consider it neither stimulant nor sedative, but tonic, that is by the specific action on the capillaries whether directly on their tissue or through the medium of their nerves it causes them to contract, when (though all the injecting force of the heart where taken off by sedative treatment) they would not have had power to close; when introduced into the circulation, arriving at the capillaries, which cannot be otherwise come at, giving them tone to contract analogous to the effect of an astringent applied to external sores; liquor arsenicalis, nitrate of silver, sulphate of copper, colchicum, &c., have a similar action, some more applicable than others to particular cases. This I say is the rationale also of what is called stimulating the secretions of internal organs, when their capillaries are weak they have the tone restored by mercury, and the secretions thus renewed, but it should not be forgotten that mercury like some other tonics in excess becomes poisonous, and may cause inflammation in other parts as it does in the gums, on the principle adduced before, that one degree of contraction of the capillaries is necessary to reduce inflammation, a still further degree will stop nutrition, and bring on wasting and disease, as syphilis is starved out sometimes at the expence of the constitution. Children and young persons while growing are very subject to inflammation because their capillary system is in an expansible state, which accounts for their gums being difficult to effect by mercury. Both arsenic and sulphate of copper occasionally produce ptyalism and are otherwise analogous to mercury in their actions. Rheumatic inflammation of the fibrous tissue of which the capillaries are very

minute cannot be cured by common depletory antiphlogistic means but yields to colchicum, mercury, antimony, bark, &c. introduced into the capillaries through the circulation.

Now these medicines, bark, arsenic, nitrate of silver, cure what are called nervous diseases which I consider inflammation of the capillaries of the nerves themselves, for irritation as before mentioned though a part of general inflammation, is itself an inflammation of the nerves, but their capillaries being so fine, so little palpable, it is difficult to detect that state. I have thus endeavoured to prove that the proximate cause of all inflammatory disease even of the nerves is in the capillaries and that proximate cause debility.

The NARCOTIC principle in drugs is that which diminishing the sensibility of the nervous system, allays pain and procures sleep; narcotics must be distinguished from stimulants on the one hand and from sedatives on the other, and the distinction is the more necessary, because in nature the narcotic principle is generally combined with one of the others; hence the contradictory and unsatisfactory reports of the value of narcotic remedies, and the difficulty experienced in their application, by those who do not know the reason, why opium suits one case, hyoscyamus another; it has been very common to try one first and if that did not suit to resort to the other; but any one who knows that opium contains stimulus along with narcotic, will not administer it when the skin is hot and dry, with permanent thirst, delirium, and other evidences of symptomatic fever (pyrexia), but will on principle prefer conium, or hyoscyamus, which contains the sedative combined with the

narcotic; many know the contrasted use of these substances empirically, but those who have not experience must be guided by the consideration that some "sleeping doses" are stimulant, and some sedative, that a patient may be forced into a sleep by opium from which he will wake thirsty, feverish, and unrefreshed, when hyoscyamus would have cooled and refreshed.

Some of the Italians find fault with our using Dover's powder (pulv. ipecac. comp.), but I can prove on their own principles that we are right, no doubt it is absurd to give a direct stimulant and a contrastimulant (sedative), as for instance digitalis and wine or spirit at the same time, they even object to the *tincture* of digitalis, which appears an over nice distinction to some who give only ten or twelve drops at a dose, but when it comes to a drachm and a half, or two drachms of spirit (at which dose the Italians gradually arrive) the menstruum counteracts the medicine in a degree, and this accounts for larger doses in proportion of the tincture than of the infusion being borne, and for the assertion that the tincture is less certain in its effect than the infusion, for on a person who is not accustomed to drink wine, or other products of fermentation, a tea spoonful or half a tea spoonful of the spirit of a tincture will produce much more effect than on those who use wine, &c. as a part of their diet; but on the Italian principle Dover's powder is a judicious combination when a narcotic is required neither sedative nor stimulant, the sulphate of potass and the ipecacuan being sedative (contrastimulant), counteract the stimulant part of opium, so that Dover's powder acts nearly as a simple narcotic, the Italians I think estimate too highly the

proportion of stimulus in opium, and there are many cases in which hyoscyamus would be too depressing if given in doses sufficient to produce sleepiness, and in many cases opium would be too stimulating, so that in in fact when we want narcotic without either stimulant or sedative we cannot use the natural drugs uncombined; what has just been said will account for the alternate advantage of tincture, and extract, of hyoscyamus; now BATTLEY's preparation liquor opii (which he calls) sedativus is proved by experience to be analogous to Dover's powder and suits many constitutions better (in whatever manner it is made) than crude opium however qualified; for the stimulant part of crude opium disagrees more with some constitutions than others, and the advantage of acetate of morphia may be similarly explained. Digitalis and opium may be advantageously combined, but digitalis and brandy a direct sedative and stimulant cannot be expected to produce any combined effect.

This distinction of *sedatives*, *stimulants*, *tonics*, and *narcotics*, will assist us in understanding the operation of remedies in various diseases, recollecting that the medicines such as salts, senna, jalap, tartar emetic, calomel, ipecacuan, &c. which are used as purgatives and emetics are sedative (contrastimulant) in their operation. The effect of tartar emetic is sometimes intended to be merely local, for the purpose of emptying the stomach, and then it is given in a full dose to produce sickness, but it must be surprizing to some to be told that tartar emetic as a general sedative (contrastimulant) remedy will stop sickness, thus, inflammation of the mucous membrane of the intestines produces nausea and

sickness, inflammation of the lungs, cough, these inflammations are checked by repeated small doses of tartar emetic which are by some called febrifuge (even without bleeding this may be done), and thus tartar emetic stops vomiting or cough. James's powder and tartar emetic with or without saline combinations are commonly used in this way. What has been here said explains part of the new Italian doctrine of medicine; they rely much on stimulant, and sedative (contrastimulant) remedies; the state requiring contrastimulant (sedative) remedies, as bleeding, digitalis, emetics, and purgatives, they call a stimulant diathesis (disposition) of disease, the state requiring stimulants a contrastimulant diathesis, for example phrenitis is a disease of stimulant diathesis, delirium tremens of contrastimulant diathesis, again, when the inflammation is subdued the diathesis being overcome and changed, a convalescent from inflammation is in a state of contrastimulant diathesis requiring stimulants.

The new Italian school as above stated can treat gastroenteritis successfully with tartar emetic and saline medicines, the new French school says those substances ought not be employed which being, as they think, irritants or local stimulants to the organ must increase irritation and inflammation in the already inflamed parts, but in the first place, experience proves that the constitutional sedative (contrastimulant) overbalances any local irritation if irritation there be from the remedies for health is restored, but again, even granting that tartar emetic, and neutral salts, and other cathartics were local stimulants or irritants, it is well known that nitrate of silver, sulphate of copper, muriate of mercury

or of soda, turpentine, resins, balsams, vinegar, improve external sores, and if an external inflammation be improved by what are called local stimulants, why not an internal? experience answers the question despite of all theory; and it is clear that the mode of curing inflammation by starvation, venesection, and leeches, is only adopting the Italian contrastimulant, or English antiphlogistic plan, in part, omitting the administration of emetic and cathartic substances. Many of the Italians over-rate the stimulant property of opium, and from a too exclusive attention to stimulants and contrastimulants would exclude it from many useful applications in disease; but experience and our practice prove that it is often very useful in relieving the suffering of the patient as well as curing him; in gout in the stomach and inflammation from poison by arsenic or cantharides pain would kill, before the natural termination of inflammation if not relieved by anodynes. Yet to those who understand the new Italian doctrine of medicine, it has thrown great increase of light on the treatment of diseases, as well as Broussais' system, though he also is too exclusive.

Digitalis and bleeding are consistent in their action, bleeding and brandy are opposite in their action, and yet occasionally it is necessary to bleed and give brandy at the same time, as the patient must be relieved from an overload of blood and yet would sink if not kept up by the stimulant; now this is thought by some to confute the new Italian doctrine of medicine, but the venesection in this case may be said to be but a mechanical relief unconnected with diathesis, as for instance in such a disease as cholera of India where the powers

sink so rapidly that the blood becomes viscid and the heart powerless, the direct indication is to stimulate it by wine, brandy, and *tincture* of opium, and relieve the load of circulation by venesection at the same time; but without going so far for example we may refer to a similar treatment being found necessary in some cases of inflammation of the lungs or bowels here, though such cases do not often occur and especially if proper active depletion has been resorted to in the beginning of the inflammation.

Narcotics stop the conducting power of the nerves which I illustrate thus, the arm being laid across the back of a chair, or a limb otherwise compressed in one place becomes what is called asleep, from pressure on the nerve, sensation and action are lost, or if not quite lost much diminished, and at the same time "pins and needles" a pricking sensation is felt.

Now different narcotics produce more or less of these effects, a minute quantity a fourth of a grain of extract of aconite dissolved in the mouth and swallowed, produces the pricking sensation and loss of power of the muscle of the fauces so as to render speech and deglutition difficult, belladonna a similar effect, less pricking than sense of dryness, hyoscyamus also sense of dryness. The limb being asleep is from the pressure interrupting the conducting power of the nerve by pushing the medullary matter &c. out of a part of it, if the medullary matter is but slightly separated the nervous influence is passed like the sparks of electricity, causing the pricking, but if the gap or space be too great there is no sensation transmitted at all; if the arm be rubbed so as to press back the medullary matter, as it begins

to meet, the "pins and needles" are felt. I have known the hand to remain powerless for many months before the medullary matter could be rubbed into its place, after the person had fallen asleep with the head leaning on the wrist over the back of a chair.

Narcotics, judging by the phenomena described and others familiar to medical men, interrupt the conducting power of the medullary matter, and as there is no mechanical pressure we can account for this only by some chemical action or union with it.

To recur again to the difference between narcotics and stimulants on the one hand, and narcotics and sedatives on the other; sedatives diminish action but not by interrupting the conducting power, for digitalis or green tea render the perceptions more acute and produce wakefulness instead of sleepiness; it is not until the nervous influence is actually exhausted so as not to be sufficient in quantity to produce action that there is any defect in the perceptions and then there is delirium not sleep. Aconite which is a union of narcotic and sedative produces a state of delirium, whereas opium which is narcotic and stimulant produces sleep.

We see that the action of medicinal agents become most opposite when the proportional quantities are varied, and according to the state of disease which may exist; hence it requires great attention to separate in the mind and estimate the causes of phenomena; the whole practice of the healing art is full of apparent contradictions, thus opium makes the pulse hard or soft, promotes and takes away appetite, the same means appear in one instance stimulant in another sedative; venesection sometimes makes the pulse smaller, some-

times fuller. But when we speak of remedies, as stimulant, sedative, tonic, narcotic, and their compounds, we are to consider their moderate action whilst they are working on the natural powers of the organs, and not the exaggerated or poisonous effects when they begin to excite inflammation or irritation; thus brandy or wine in moderate quantity acts upon the nerves of the stomach and other parts in a healthy state as a stimulant, in too great quantity there is a noxious effect on the organ, its natural susceptibilities being perverted and a sedative effect is communicated to the nerves of the heart, &c. so that a person intoxicated will become sick, with cold sweat and weak pulse, though wine and brandy are stimulants. Again, the state of disease causes deception as to the nature of an agent, for in inflammation which makes the pulse weak from its severity, brandy by increasing the inflammation would weaken it still more, whilst on the other hand sedatives as digitalis, antimony, and bleeding, as has already been explained raise the pulse by relieving inflammation.

Tonics, even mild ones, as bark and iron by oppressing the stomach like too much food will excite nausea; others, as arsenic, will occasion irritation and inflammation, which appears to confirm the opinions of Broussais, but the full tonic or sedative effects of medicines may be produced without risk, and with benefit, if administered in proper quantities, and not misused, though he anathematize arsenic, salts, senna, tartar emetic, &c.; praised be Rasori and his followers Tommasini, and the rest, who have given us myriads of proofs if our British practice did not afford a sufficiency. Sulphuric and oxalic acids which like arsenic produce fatal

inflammation will if sufficiently diluted with water afford not merely an agreable and refreshing beverage but are efficient in allaying inflammation.

The varieties of inflammation may be understood by always recollecting, that the heart is acting against the arteries and that both heart and arteries have their force from the nerves; thus inflammation may go on when the pulse is very weak, when the heart is acting much more feebly than natural, but the arteries being even more weak in proportion give way; as we see in broken down constitutions where inflammation is cured by stimulants, which raise the pulse, but which at the same time by improving appetite and digestion nourish and increase the energy of the nervous system, so as to communicate to the arteries a tone or power to resume their healthy action more than equivalent to the increased action of the heart. In some cases by good food and tonics such as bark without stimulants we communicate an energy to the nervous system which restores the healthy action of the capillary arteries, and it is the discrimination of cases where stimulants are admissible with tonics or where tonics should be accompanied by evacuants which constitutes skill in conducting the constitutional treatment of diseases, and by a reference to the relative state of action of the heart and arteries still as depending on the nervous system, we can understand how tonics are useful in many instances by communicating power to the capillary arteries through the nerves where stimulants would be injurious by increasing the heart's action, and tonics are likewise beneficial in keeping up the energy of the nervous sys-

tem so as to restore the proper action of the capillaries in conjunction with abstraction of blood and evacuant remedies.

To beginners the treatment of inflammation in different ways must appear contradictory, even to practitioners of experience it is difficult, but will be found rational and consistent by a reference to the various states both of the parts and the constitution which exist under the name of inflammation.

Let us now examine some of the more common phenomena of inflammatory affections and the remedies applicable, in order to see how far we are borne out in the preceding statement, beginning with the simplest, unconnected with what is called constitutional disturbance, and proceeding to the more aggravated and serious forms of disease. Take as an instance, the eye or part of the skin subjected to a blow, or a stream of cold air; or heat applied to the skin so as to give pain and excite redness without blistering, or the effect of a mustard poultice, or of a cantharides plaister taken off before it has time to rise, having only produced redness, here upon visible parts the first and slightest degree of inflammation arises, that is a blush of redness with a degree of tumefaction of the vessels, and pain, or sensation of heat or itching in the parts; or suppose a mucous membrane slightly injured, as that of the nose, or windpipe, by sudden alternation of temperature, &c. producing either painful dryness, or an increased flow of mucus with uneasiness or itching which is the slightest degree of inflammation in those parts, catarrh; or the mucous membrane of the intestines injured by bad food, as sour fruit or sour wine which produces a flow

of mucous fluid with uneasiness or griping, called diarrhœa.

It is the fate of medical men above all others to be called upon perpetually to reconcile apparently contradictory assertions, as how does it happen that the distended state of the capillaries, which sometimes produces increased flow of mucus, should at other times produce dryness; it is because the secretion of the lubricating fluid is stopped when the capillaries are over distended (vide p. 28 to 30), and the renewal of the secretion is a sign of the diminution of inflammation, or in other words, when a painful dry cough becomes loose and the phlegm begins to come up the case is improved; the mucous membranes in their healthy state can scarcely be said to be moistened, more than the serous, by their vessels, they are merely kept lubricated and soft, now the effect of relaxation of irritation or inflammation on the vessels of the mucous follicles sometimes is to produce a thin saline or serous fluid instead of the thickish mild mucus, but as the vessels recontract as inflammation subsides they secrete the mild mucus again.

These are instances of simple local disease depending upon one morbid change an enlarged state of the minute capillaries of the part, either from the vessels themselves being forced as by a blow, or by their tone being diminished, from their nerves suffering injury, by excess of cold, or heat, or acrid matter applied to them.

With these examples hitherto given of simple local inflammation there have been no constitutional symptoms added. The nervous system, the brain, spinal and ganglionic nerves are not affected, the heart's action

as measured by the pulse is unaltered, the digestive system unimpaired, the appetite, and functions of intestines, and kidneys, going on as before.

We next have to consider the restoration to a healthy state; in the examples given the parts will generally recover of themselves gradually, the vessels contracting to their natural size, or if they do not, mere local means will be sufficient, as the application of cold and astringent lotions, with abstraction of blood by leeches, to unload the vessels, warm stimulating liquids or astringents internally, warm fomentations externally acting through the medium of the nerves, and thus the inflammation either is cured or subsides by what is called resolution.

Now as a second case take a greater degree of local injury where the minute arteries have suffered so much that they cannot recover of themselves, nor by mere local applications, here the first symptoms of constitutional disturbance arise, restlessness or general sense of uneasiness, increased action of the heart; showing that the nervous system is partaking of the irritation of the nerves of the inflamed part, and the heart become more excited by its ordinary stimulus, from its nerves being more susceptible; a very common effect of the sympathy of the nervous system in this stage is a diminution of sleep which is sometimes attributed to pain, but it depends more on the degree to which the nervous system is effected, for persons will sleep with much more severe pain, than what will at other times banish rest. In this case however, in addition to the local disease, which exists as in the first case, the chief marked symptom is increased force in the pulse, and as this

increase of force in the injecting action of the heart tends to keep up and aggravate the disease, it is necessary to diminish its action, and guard against renewal, to diminish the vis a tergo we may either take blood by venesection, or by putting on a greater number of leeches than in the former case, we may lower the pulse, at the same time that we relieve local fulness; having thus lowered the pulse we are to avoid what will raise it again, and as exercise and generous diet do this, rest and low diet are essential parts of the anti-inflammatory or antiphlogistic treatment. In addition to rest and low diet we have other means besides abstraction of blood to lower the pulse, that is to say, by sedatives, and by means of drugs of the emetic and purgative kind, both of which, by diminishing action of the nervous system, have the tendency to produce temporary faintness, and weak pulse, and which sedative effect, constitutes their utility, in inflammatory disease, much more than the mere emptying of the stomach and bowels; and antimonials, neutral salts, &c., are for this reason given in frequent small doses, which do not cause vomiting or purging, under circumstances where we wish neither to take away blood nor exhibit cathartics or emetics in full doses; digitalis has a power of controlling the action of the heart, but though it has its advantages, its influence is not so certain and manageable as to make it a substitute for blood-letting, the relief from which is usually instantaneous, whereas some time is necessary for digitalis to produce its effect, and when it begins to lower the pulse, it must be then closely watched, least it produce too great depression; so that in acute diseases, for the reasons adduced and

others to be mentioned elsewhere, digitalis may assist, but cannot generally supersede blood-letting, and on the other hand is of the greatest use, when blood cannot be spared.

After all that has been said of *sedatives dimishing* the *drowsiness* of plethora, *digitalis* will *procure sleep*, where excitement and wakefulness have been kept up by irritation or inflammation of the brain, with a full hard pulse, such as we often feel with hypertrophy, &c. of the heart, and which hardness must be combated by digitalis, after bleeding, &c. the defect of the heart being organic (of structure) no amount of bleeding could remove, but it may be relieved without profuse expenditure of blood; it is needless however for me to multiply examples, the student must apply the rules at the bed side, and the memory of any man of experience, who reads this, will supply him with illustrations, but this organic cause of hard pulse is worth mentioning as it is a source of embarrassment to young practitioners.

In these first and second cases or degrees, we have had the same structures under consideration, as the subjects of local disease produced by injury of some kind, the eye, the skin, the membranes of the chest, or abdomen, &c., as subjects of slight ophthalmia, erysipelas, catarrh, and diarrhœa, but curable before having gone the length of producing, what is called, constitutional disturbance, beyond raising the pulse; and but few remedial agents have been mentioned, nothing being said of blisters and other counter-irritants, or the warm bath, &c. but only what is judged merely sufficient for a brief illustration of our subject.

The raising of the pulse has been traced to irritation

propagated from an inflamed part. By irritation is meant that state of the nerves which renders them more sensible than natural, so that pain is produced by common occurrences which ought not to affect them, such as pressure either from external things or even of the surrounding parts; this irritation is not always confined to the nerves of the inflamed part, but often spreads to the branches of nerves which communicate with them, thereby producing *sympathetic* irritation, and pain, or tenderness on pressure, &c., tooth-ache produces tenderness on pressure in the temple, uterine irritation tenderness on pressure over the abdomen, and sympathetic cholic pains, or diarrhœa, &c. Now observe these sympathetic irritations take place *without inflammation* being communicated to the sympathizing part, though sometimes the inflammation spreads; the cheek will swell and inflame from the tooth-ache, the inguinal glands from the uretha being inflamed.

It was shown that in the healthy process of reparation of injury, or inflammation, the nerves are not in a state of irritation, on the contrary they are sound and give tone and power to the capillaries, whereas morbid inflammation begins in the nerves, and irritation of the nerves however produced may occasion it; irritation being, not inflammation but a part of the condition of inflammation, sometimes beginning it, at others existing for a time without eventually proceeding so far as to produce it.

C. Bell has shown that there are different sets of nerves to every part which has muscular motion, we may conceive that if this were not the case, the expenditure of nervous influence might produce inflammation,

by robbing the capillaries if they were not supplied by other nerves besides those employed in muscular motion. I doubt whether there are more than two sets of nerves, as I conceive the capillaries to be supplied by the nerves of sensation, the involuntary actions even those of respiration, being dependant upon the superaddition of the ganglions, by which apparatus though sensitive communication be not cut off, as some have supposed, yet action is rendered independent of volition, either where there even exist nerves of direct volition such as the respiratory, or where there is no nerve of volition, as in the intestinal muscles, and heart; and hence I judge that the ganglionic cineritious tissue, secretes nervous influence, for the supply of certain parts, which either permanently or occasionally are not directly supplied from the cineritious part of the brain.

The existence of at least two sets of nerves, accounts too for the nutrition going on by the capillaries in a limb which is paralyzed; and on the other hand muscular action will be strong where capillary action is weak, in a part which is irritated, or inflamed, as we may judge by the tormina and diarrhœa of inflamed intestines, and the vomiting in gastritis, but in lumbago voluntary action is suspended on account of the pain, not loss of power, and in the involuntary muscles as the heart, irritation, direct or sympathetic, increases motion, or action, but the action will be weak when the muscle becomes deteriorated in structure, inflamed, or flabby, or there is a deficiency of supply from the nervous system as in typhus; or under the operation of sedatives.

The action of muscles and of capillaries, is produced by nervous influence passed into them from their nerves,

but in a very different manner in each, the muscle is made to contract by the sudden imparting of it, analogous to the shock of electricity, by which electricity it may be made to contract when removed from the body, on the other hand the contraction of the capillaries is constant from a constant operation of their nerves, analogous to the continued subdivided galvanic action, shocks continued produce irritation, inflammation, congestion of the capillaries, by leaving them for intervals destitute of influence, during which they give way to the vis a tergo.

From physiological and pathological observation we may deduce, that nervous influence produces three phenomena, muscular contraction, sensation, and capillary contraction; we have seen that these phenomena alternate in different parts in the natural routine of life, and under the control of medicinal and other agents, (p. 49). We likewise uniformly see, that when *capillary action* is *stopped* or *diminished*, (if the life of the part be not destroyed so as to annihilate all sensation, motion, &c.) the *extra influence* goes to the production of *sensation*, or muscular action, or both together, this is IRRITATION, local, or sympathetic evinced by pain, soreness, itchiness, &c. with more or less of muscular action, which is sometimes spasmodic, as griping of bowels; or alteration of pulse, that is, increased frequency, not always increased strength, in as much as increase of action or effort in a weakened organ cannot supply force.

Capillary action is stopped in two ways, (besides *mechanical*, *chemical*, or other *destructive* injury,) either by directly diminishing it, by depriving the nerves and

consequently the capillaries of influence, as by extra heat, or electricity, or capsicum, or cantharides, or such agents called local stimulants, which expend it; or on the other hand by increasing capillary contraction, by astringents, cold, &c. until it stops itself by excluding the blood (or serum). This second cessation of capillary action is not merely from the contraction arriving at its utmost, but the capillary transmission of nervous influence, goes on only whilst there is blood or serum in them, consequently, when the contraction has arrived at its utmost, the power to continue it also ceases, so that excessive action produces loss of power, and inflammation *may* result (though not necessarily), when after irritation and tenderness, which is the first step, we have redness, distension, loss of power, congestion, as the result of irritation, without its always proceeding to inflammation.

Thus though astringents by contracting capillaries usually relieve the irritation of inflamed parts, yet in excess they may cause irritation, either applied externally or taken into the stomach, as evinced by nausea and vomiting. Sedatives also, in excess, whether combined with astringents or not, produce irritation, for it is evident that from their taking off the injecting force by diminishing the action of the heart, like blood-letting, the capillaries will contract too much, and irritation result, which will account for the pulse becoming frequent and weak from blood-letting, there being irritation from capillary contraction and less blood to excite the influence, and sometimes nausea and vomiting will thus be induced by bleeding, the sickness will be influenced of course by the quality of

the contents of the stomach. The pain in the back or head produced by hæmorrhage, by the sedative operation of bleeding, or by the sedative operation of whatever produces great sickness, is irritation from over contraction of the capillaries.

This will account for cathartics being assisted by emetics, and both by bleeding; the operation of a cathartic is from a sedative irritation, if a little ipecacuanha or tartar emetic (which are sedative) be added, the operation will be more certain, and bleeding has the same effect, especially if there be hard pulse from inflammation; and on the other hand, if there be diarrhœa from inflammation of the mucous membrane of the intestines, bleeding will diminish the purging by diminishing the irritation and inflammation, which explains the adage of Celsus, that bleeding relieves obstinate purging as well as obstinate costiveness.

Again, on the other hand, if there be obstinate constipation, with pain, irritation, but not inflammation, called colic, which is mere irritation, as from sour fruit, &c. neither bleeding nor purgative medicines will afford direct relief, like laudanum, hot water with wine or brandy, or the warm bath, or fomentations. These are good examples of the difference between irritation and inflammation, and the irritation of cathartics may be set up with safety when they are required without producing gastroenteritis, as, whoever sees the quantity of calomel and jalap expended by the English, and of those medicines and gamboge &c. by the Italians, without producing gastroenteritis, can testify.

At the same time there are many, many chronic cases of diseased mucous membranes which will be more

benefitted by liquid diet, and mucilaginous medicines, and lavements, than by emetics, cathartics, stimulants, narcotics, or tonics. Here again I must repeat that apparent contradictions may be reconciled by carefully distinguishing between remedial and noxious agencies, as when I pointed out that tonics are not stimulants though arsenic made the pulse hard when it began to poison, as mercury, &c. useful in skilful hands, "but children and fools, &c." Lunar caustic properly applied will heal the skin, improperly will burn a hole in it; whoever does not know of what strength to use nitrate of silver, or sulphate of copper, had better confine himself to oak bark, or alum, which cannot corrode; or if he does not know how to modify arsenic, or croton oil, he had better trust to Peruvian bark, and castor oil.

If a man be dexterous he can perform lithotomy with T. Blizard's knife, but if not he had better use a gorget; as an awkward ploughman will go safer with a plough that is guaged by a wheel, than with one that is entirely dependant on the management of skilful hands, but being well guided is the safest and most efficacious, especially in difficult circumstances and rocky ground.

A reference to the effect upon the capillaries as influenced by the nerves, will guide the surgeon in the application of cold, or heat, &c. and explain why cold sometimes does mischief, instead of putting back a tumor, for which purpose it was applied. Goulard is sometimes too sedative. In many cases neither heat nor cold is agreable. If the inflammation or rather reparatory process be healthy, as after an accident cold usually gives relief if the injecting force of the heart

though natural be too much for the weakened state of the part. If there be diminished vitality in the part from morbid inflammation, or a weak nervous system, warmth will usually relieve. Local stimulants, have an effect analogous to heat, which though they expend the nervous influence so as to produce inflammation of a sound part, are highly useful in some cases of local inflammation, where the nerves are languid, though diffusible stimuli which produce intoxication, and raise the pulse, would be injurious, as we see exemplified in the effect of capsicum in quinsey, and scarlatina, in which it is highly beneficial not only as a gargle, but taken as an internal medicine, healing the intestinal mucous membrane, when wine would aggravate the accompanying fever.

Tincture of opium combined with astringents, is useful as a collyrium, in cases where belladonna would be too sedative, though I have seen belladonna prescribed in cases of deficient nervous energy, where of course it produced an increase of the debility, which was subsequently relieved by the stimulant application.

We have example of irritation of the nervous system with the stoppage of capillary action whenever a part however minute dies, evinced by a morbid increase of sensibility in the rest of the system, so that the ordinary surrounding temperature appears cold, and the person shivers, this shivering, called rigor, is a most constant accompaniment of the formation of abcess, and has usually been attributed to the formation of pus; but is the forerunner of suppuration, not connected with it, but with the death that precedes it; for the formation of pus is part of the process of reparation, though if it be confined so that it cannot escape and is not absorbed,

it will produce additional irritation; this is the progress of ABCESS, a portion of cellular tissue gland or other part inflamed becomes disorganized, dies, accompanied by shivering, the process of reparation by granulation begins, but as the pus from the granulations cannot run off as when upon the surface, the pus is collected, causing a tumor, if this pus is not absorbed faster than it is secreted, distension takes place, and the pressure of the pus will be greatest towards the surface, in consequence of its fluid nature, under the influence of the pressure of surrounding parts, modified by whatever bone and fascia may be therein; when the pressure towards the surface is so great as to stop the capillary action, a new layer of the soft parts dies; there is usually a renewal of shivering, in this progress of the abcess to the surface, which is called pointing, and as the constitution sometimes suffers much during this renewed irritation, it might be thought that it would be beneficial to anticipate the natural exit of the pus by making an opening, but the objection is that if the pus be not allowed to make its own way, at least near to the surface there will be a very tedious process in healing from the depth of the wound, though this lesser evil must be disregarded if the constitution is suffering from the renewal of rigors, &c. called hectic.

Rigors may be observed in a variety of cases of cessation of capillary action, as when there is the death of a spot of cellular tissue which is always the case in the common boil (furunculus); and in carbuncle which is but a gigantic boil, we may know when it is spreading or burrowing by a rigor, and the following day it will be found that the margin has enlarged. In the commencement of erysipelas in which there is a loss or

cessation of capillary action though the part does not actually die, there is shivering before any alteration of the skin is perceptible, though upon examination the surface will even then be found tender.

Irritation is sometimes considered synonomous with pain, but is not always so, it is that state of nerve which produces pain, but often exists producing sympathetic pain in another part, though none is felt in the seat of inflammation, if not pressed or moved, as in hysteria, whilst the person is at rest no pain is felt in the uterus, it being placed so as not to be annoyed though its tender state is evinced by the slightest touch, or even by the pressure on the perineum, as in sitting down; in many cases all the branches of nerves which communicate with those of the uterus being irritated render their parts tender on pressure or painful on motion, as for instance, though the uterus being quiet and protected, its irritable nerves are not disturbed, yet the sympathetically irritated nerves of the intestines are, so that there are constant colic pains from the peristaltic motions, for the same reason there are pains in the loins from the least movement, or in the hip simulating sciatica, or producing apprehensions of disease in the hip joint; the parieties of the abdomen not bearing motion, or the slightest pressure, so as to simulate peritonitis; the motion of the heart causes pain in the left side, the most constant and tormenting of the painful sympathies of hysteria; the stomach is irritable both during utero gestation and at other times, so as sometimes to produce pain after eating, sometimes repeated sickness. In like manner in hepatitis, the liver in some stages of inflammation lying quiet, and protected, no pain is felt in it

unless pressed, but the patient is annoyed in consequence of the irritation of communicating branches of nerves, as for instance by sickness of stomach, pain of the shoulder, and head, &c. The kidney inflamed produces sympathetic sickness, &c., in the same way, and inexperienced persons do not suspect or cannot find out which is the organ affected when nausea or cardialgia is the most troublesome symptom. This will show how most diseases disturb the stomach and consequently the digestion; but in how few cases of indigestion is the stomach itself first in fault, though dyspepsia is a most convenient word, and the poor stomach is blamed for faults not its own, nor is it clear that the digestive powers were out of order because blue pill cured disease which produced sympathic irritation of the stomach, nor that the action of the blue pill was particularly on the stomach, but blue pill introduced into the stomach will of course find its way into the circulation, and thus to whatever organ is diseased, which will account for the innumerable cases to which it is applicable.

As a third case or degree of disease let us consider the local affection, such as inflammation of the eye, lungs or bowels, &c., either too great to yield to the remedies applied, or as having been neglected, and continuing the irritation to the nervous system so that in addition to the increase of pulse, we shall have evidence of disturbance in the functions of the nervous system itself, and in the digesting system through it; pains in the head, back, and limbs, with lassitude, or feeling of weakness, showing that the nerves of voluntary action are affected, alteration of temper, hurry of thought, not amounting to delirium, yet enough to

show disturbance of the functions of the brain; want of sleep, wrong perceptions, as fancying that there is a disagreable smell; chilliness, and morbidly increased heat of the skin, with dryness, showing a want of tone from deficient nervous energy, for as long as the vessels of the skin are kept in order by the nerves, the secretion of insensible perspiration keeps the skin cool, and soft. The digestive system is now also deranged, the sympathetic nerves partaking of the irritation, as well as the cerebral and spinal, and of course the organs supplied by them; there is loss of appetite, imperfect secretions in the primæ viæ, causing thirst, frequently nausea, and deranged function of the intestines, constipation or diarrhœa. The kidneys also evince a loss of power as they allow more of the coloring matter of the blood to pass, and their secretion is dark and reddish as soon as the pulse rises.

The combination of symptoms here enumerated constitutes what is called the *constitutional disturbance*, or *pyrexia*, the *symptomatic fever*, from local inflammation. We have traced them from the local injury to the constitutional affection; thus a part which we see or know to be inflamed, deranges the functions of the brain and nervous system, and consequently the functions of the various organs, the skin, heart, stomach, bowels, kidneys, &c.; this then is symptomatic *fever*, it is that assemblage of symptoms which agrees with Cullen's definition of synocha, viz. heat much increased, pulse frequent and hard, urine red, the sensorial functions but little disturbed, and the power of voluntary motion diminished. This is the symptomatic inflammatory fever, the *symptomatic synocha*, but we have also an

idiopathic synocha which sets in, in Cullen's words, without primary (or preceding) local disease, that is to say the symptoms of lesion of the nervous system are not preceded by any hurt, or local inflammation, or pain, external or internal; but the local disease begins simultaneously, it is in my opinion, the nervous system itself which being injured produces synocha, or idiopathic inflammatory fever, as it arises in hot climates and in this country in the heat of summer in labourers exposed to work under the heat of the sun, or sometimes from the opposite cause of excessive cold, combined with deprivations, excesses, depressing passions, or other causes of injury to the nervous system.

The treatment here is still the same, bleeding by lancet, leeches, or cupping, low diet, and rest, attention to the bowels, antimonial or other sedative, emetic, or diaphoretic medicines, and observe still local applications: if the inflammatory fever is from an inflammation which has been brought on by a blow or other injury, as a fracture, or an inflamed tumor in the mamma, or groin; or an inflamed arm, and axilla, from a punctured finger; local applications, leeches, and poultices, or lotions; if the inflammation be in the chest or abdomen, leeches, fomentation, blisters, poultices, &c.; if the inflammation be in the integuments of the face and head in form of erysipelas, lotions or other applications, and blisters applied close to the part; and if it be idiopathic synocha, still, along with general remedies, local applications; cold lotions applied to the head with leeches, and blisters, &c; to relieve the inflamed brain or meninges; sponging the skin

with water also produces a sedative impression on a large proportion of the nervous system.

In the instances adduced hitherto the practice is straight forward, the indications of cure evident: to use local applications, to correct disordered functions, and lower the force of the circulation, so as to diminish the current of the blood into the inflamed part, by blood-letting, &c.; the necessity of which is agreed upon, alike by those who consider the throbbing of the arteries as an evidence of increased arterial action, as by those who consider it only an evidence of increased action in the heart, and deny that there is increased arterial action in inflammation, whether the pulse be strong or weak.

We now come to consider the fourth stage, when after the foregoing state has existed for some time, the power of the nervous system becomes exhausted, from continued irritation, want of nutrition, &c., and the heart though still under the influence of sympathetic irritation, deriving less energy from the nervous system, has less power to contract, and really becomes weaker, as being less nourished, therefore the pulse, though still hard, becomes less strong; sometimes now the brain from irritation passes into inflammation, or at least congestion, its functions become more impaired, the thoughts more confused, until at last actual stupor, or delirium comes on, the pulse losing even its hardness, becomes soft and weak, the heart not being able to empty itself causes congestion in the lungs, the capillaries of which are also deficient in power, and the blood not being purified causes still greater stupor and

the patient is said to be in a state of low or typhoid fever, instances of which may be seen in local inflammations from disease or injury, as when there is inflammation in the chest or abdomen, or after wounds or operations where the sympathetic fever becomes typhoid, but if the brain does not become inflamed, the patient may die worn out with all the senses perfect, as by *hectic* fever.

Now the idiopathic synocha or inflammatory fever also may become typhoid; according to Cullen's statement, synochus is a fever beginning with synocha and ending with typhus; or, we may see a patient become typhoid without any previous strength of pulse, and with a cool skin, as from local injury for instance when the nervous system has received a shock with the injury, a severe accident, or operation. Thus, tracing from smaller injuries and their consequences to greater, irritation from slight inflammation, as a single hœmorrhoid, produces shivering, and heat of the skin, *feverishness*, *pyrexia;* the spreading of the inflammation to a greater portion of the intestine will produce symptomatic inflammatory *fever*, and a still further extension of the mischief, inflammation of the bowels, and *typhoid fever.*

But pyrexia exists which will never or scarcely ever proceed to fever, as shivering and heat of skin from hysteria, or as will even arise from voluntary over long retention of the contents of the bladder or rectum, and also from acidity in the bowels of children, or teething, which last more frequently however produces serious consequences.

Now we may have idiopathic typhus without any previous synocha, the heat being even below the natural

standard, as when the brain and nervous system are overpowered at once by the poison of contagion, or foul putrid effluvia, either with or without previous predisposing circumstances of over fatigue of body or mind. Query, is typhoid fever inflammation of the substance, synocha or phrenitis of the membranes of the nervous system, analogous to the difference between inflammation of the substance or membranes of other organs, as between peripneumony (inflammation of the lungs), and pleurisy (of their membrane); enteritis (of the intestines), and peritonitis (of their membrane), &c. &c.; the inflammation of substance more completely interrupting the function of the organ, in each instance, than that of the membranes, though inflammation of the membranes produces disturbance of action, and pain; in typhus we see the function of the nervous system, thought and volition especially interrupted. This state of typhoid disease is much more difficult to treat, the indications of cure are more complicated if not contradictory, and medical practitioners are more at variance in their mode of attempting to remove the symptoms. Here however as in the former instance attention must be paid to the local disease, but above all in the idiopathic typhus, lotions to the head are the essential local application, to constringe and give tone to the vessels of the brain, and the most unequivocal remedy in our power. Besides local applications due attention must be paid to the alvine and renal secretions, but the most important question is as to the administration or not, of stimulants, and it is only by careful observation of actual disease at the bed side, that we can arrive at the knowledge necessary to guide us.

Those (the Brunonians) who looked upon the typhoid state (as it really is) as debility, and considered *only* the effect which stimulants would have on the healthy frame, and that in many instances they are useful, and necessary, in surgical cases where there is much debility, resorted to wine and opiates in typhus fever, not considering that the disease included always an inflamed or congested state of the brain and nerves, and that though in some instances the stimulant might be borne with impunity, yet by increasing the action of the heart the vessels of the head would be still more injected, besides the specific injurious effect of the stimulant on the capillaries of the cineritious substance, and in fact experience proves that cold to the head, and moderate purgative and diaphoretic medicine, will cure typhoid patients, or prevent the typhoid state from occurring, whereas when wine and opiates are employed the disease frequently proves fatal. I had a good opportunity of seeing the contrast of the different modes of practice during the fever which prevailed in Italy some years ago, the proportionate mortality being very much greater in an hospital where the stimulant practice prevailed than in that under the direction of Dr. Aglietti, in Venice, who I suppose out of compliment, called his manner of practice, the English, consisting of contrastimulants, and the application of cold water, and free ventilation; but though the British may have commenced a similar practice at the same time, that is during the war, the adoption of contrastimulants in typhus was not introduced into Italy by them but by Rasori, nay more in opposition to the stimulant practice which he had learned in England.

The strongest mode of illustrating the risk of stimulating a typhoid patient is to suppose that when an important organ, such as the lungs, or brain, is inflamed, the typhoid state of collapse may just be one of the provisions of nature to allow the parts to recover, as they would during the collapse of syncope produced by bleeding, and of course when so important an organ as the brain itself is diseased, we should be careful how we set the heart pumping more forcibly than necessary; only let us not go into the opposite extreme, and so let patient die for want of a spoonful, or even a pint of wine or brandy, (for the quantity must be relative depending on the effect) if they are actually sinking, only be quite sure that there is danger of sinking, before resorting to stimulants, and when the rallying point is gained, caution is necessary not to push them too far; the symptoms of sinking are fluttering, weak soft pulse, cold sweat, lying on back, respiration oppressed, involuntary dejections, but wine will not agree whilst the pulse is hard and sharp, and the skin is decidedly dry and hot, even when there is subsultus tendinum.

The functions of the primæ viæ are so uniformly disturbed in fever, whether symptomatic, or idiopathic, as has been pointed out, that it is not surprising that Broussais should fix upon the mucous membrane of the stomach, and bowels, as the seat of the immediate cause of idiopathic fever, but I think that I have shewn, that fever is lesion of the nervous system, if commencing there, idiopathic, if produced by inflammation of other organs it is symptomatic. Some inflammations of the viscera arise during fever and are very truly said to be produced by the fever, that is, the organ having

been predisposed, when it is robbed of its due supply of nervous energy, by the derangement of the functions of the brain, its vessels fall into the congested or inflammatory state, and when the cerebral symptoms diminish if not before, it is found that some organ is affected, this is the case with the lungs most frequently in these climates; and the mucous membrane of the intestines, and the liver in hot climates; so that it is a doubt with many whether the fever has brought on the hepatitis, or the hepatitis the fever, or whether the inflammation of the mucous membrane brings on the fever, or the fever the inflammation of the mucous membrane, as in acute dysentery. I think sometimes in the immediate attack the disease in the first instance is the fever, but even then the brain has been rendered more susceptible of the exciting causes of fever, by the previous debilitated state of the organs, the liver, bowels, or brain itself, and the moment the fever begins the organ has its inflammatory or congested state increased and so rendered evident though before latent.

From the very essence of fever, as described to be in the nervous system, it follows, that the functions of the viscera must be disturbed, nay though as just pointed out, sometimes disease of one organ predominates, sometimes of another, yet every organ suffers more or less congestion, in every fever, from the loss of nervous influence; hence those who are advocates for fever being a something that pervades the whole system, say, you cannot fix any one seat of it, and on the other hand those who have taken up the notion of fever being seated some in one organ some in another organ, seldom fail in morbid examinations to find proofs of their

opinions, for as no organ escapes, that which is sought for will be found, whether the opinion lead to cerebritis, or gastroenteritis, hepatic, or pulmonic congestion, &c. &c. We have here an explanation of the obstinacy of some agues; in bark, arsenic, &c., we have certain remedies for the poison of simple ague, but several cases are found to resist them, some practitioners then resort one to the lancet, another to mercurials, another to leeching the epigastrum; the cause which prevents the ague from being cured, is visceral disease, which may have either existed before the ague, or arisen during it, the ague and visceral disease whether of bowels, liver, lungs, or spleen, &c., act reciprocally, as cause and effect, the ague aggravating the visceral disease, by causing congestion at each attack; the visceral disease by keeping up irritation or irritative fever, between the paroxysms, preventing the nervous system from being cured by bark; but if by leeching, mercury, &c., the visceral disease be cured, then the bark stops the ague.

We can understand how an unjust prejudice against bark arose formerly, from the observation that after ague was cured visceral disease remained, which was attributed to the bark "causing obstructions," and it must have been often fortunate for a person who had visceral disease with ague, when from the bark alone failing, recourse was had to mercurials, or those remedies which cured the visceral disease, but which many call helping the bark, and it is thus that arsenic acts often equal to a union of bark and mercury; for arsenic besides being a tonic to the nervous system has the power specifically of increasing the bile and otherwise

acting on the liver, besides sometimes like mercury producing salivation and curing chronic inflammations.

Considering disease then as depending on the conjoint action of vessels and nerves and knowing what agents will influence those actions, we may in our practice have always a reason for the application of remedies, and be able to combat cases such as we have not before seen or heard of. Acute diseases are those where the constitutional, the feverish symptoms are the most urgent, so as to threaten life, so that we are obliged to pay more attention to the constitutional than the local disease. Chronic diseases prove fatal only when the gradual alteration of some organ undermines the constitution by interrupting some of the nutrient processes as in decline, from slow inflammation of the lungs, or of the mucous membrane of the intestines. The Italian distinction as to tolerance of contrastimulants is useful in the diagnosis between really acute disease, and feverishness from local irritation, or chronic disease.

Men who consider themselves as opposed to each other in theory, nevertheless coincide in the essential points of practice; as Currie, Hamilton, Armstrong, Clutterbuck, Broussais, Rasori, Tommasini, and others, the object being to diminish local inflammation (congestion) or by whatever name the local disease is called, and to counteract the derangement in the organs of circulation, and digestion, all agree upon the necessity of rest, diet, and unloading the lower intestines; I might perhaps say, all upon the abstraction of blood, either by leeches or otherwise. They differ as to the use of drugs, Broussais says that the others are irritating

the mucous membrane by emetics and cathartics, though he does not entirely neglect the emptying of the bowels by enemata, but as this mode of opening the bowels does not produce such a sedative controlling influence on the circulating system, &c. as the cathartic, and emetic substances, he is obliged to abstract more blood by venesection, or leeches; the others may tell you that this loss of the pabulum vitæ does more harm than the drugs. One man treats fever by venesection, leeches, diet, and scarcely any drugs; another by plenty of calomel and other physic, and cold water externally applied, and perhaps little or no blood extracted; one man deprecates blisters, because he may have seen them applied by very bad practitioners, and put on in pairs, in cases where the patient died in consequence of other causes, but we almost all know that blisters are useful things in very many cases; there are medical men in this country who appear to me to fall in with Broussais a good deal in his opinion as to medicines irritating the mucous membrane, objecting strongly to repeated doses of calomel, in febrile complaints, and saying that emetics act on the principle of counter-irritation, but it is interesting to a third person to observe how they confirm the opinion and practice of the new Italian school, which considers them as acting like venesection in controlling circulation. Dr. Clutterbuck says, that he found emetics have a beneficial effect before he knew the value of venesection in fever.

The state of low or typhus fever, being in reality debility, as well as the state connected with gastritis, gastroenteritis, or peripneumony, it is difficult for the beginner to satisfy himself of the necessity or even safety

of using depleting (contrastimulant) remedies, nevertheless all who have experience (but the Brunonians) allow the expediency however they may explain it, and it is necessary to be as well assured as possible on this point in order to profit by the phenomena of disease.

The student can sooner be convinced of the necessity for depletion in the sunk state which is produced by inflammation of the lungs, or stomach, because he can understand the cause of that state to be the organ being overloaded and that by lightening it you restore the power of action. But the low fever being thought to have no fixed habitation, being considered as a something pervading the system, the rationale of treatment is not so evident. That fever pervades the system it is true, because the nervous system which is its seat, pervades the frame, the nervous system, not merely the brain, but the brain, spinal cord, and nerves, for the phenomena of idiopathic fever show the nervous system to bé first implicated, debilitated by a morbid poison from the first.

I have ventured to give the name of inflammation to that injured state of the brain and nerves which is the proximate cause of fever, though from the nature of the tissue we cannot always see after death, that the nervous system has uniformly undergone the same change as inflammation produces in other structures. This injury of the nerves (fever) may be produced either by disease of some part in the body, as traced above, or by a poisonous matter introduced from without in the form of effluvia, the effect of which poison is to debilitate the nervous system, and consequently all other parts as depending upon it for energy.

Yet though the fevers produced by inflammations, or symptomatic fevers, resemble closely the fevers produced by infectious effluvia, there is in the latter an immediate impression on the nervous system, produced by the morbid poison of the infection independent of inflammation of any other structure. And though symptomatic inflammatory fever, may resemble idiopathic inflammatory fever, as much as inflammatory pustules produced by tartar emetic resemble idiopathic pustules of small pox, yet there is more lesion of the nervous system in idiopathic, than in symptomatic fever, there is as it were some chemical or electric effect produced by the poison, and the violence and duration of the fever appears to be in proportion to the power of the dose of poison received, we see that one morbid poison produces fever followed by small pox eruption, another poison produces fever followed by the carbuncles and abscesses of plague; that the force of the disease is proportionate to the dose of the poison, allowing for the state of constitution; for there is mild plague, as well as mild small pox, there being all degrees from that which kills in three or four hours to that which never confines the patient to bed, who will continue to attend to his business with a carbuncle or inguinal or axillary abcess. Again one kind of poisonous effluvia from animal matter produces continued fever, another kind from vegetable matter remittent fever, and ague; these differing also in degree according to the strength and dose of the poison, from the mild ague or typhus, to those severe cases which prove fatal in a few hours; from the mild agues and remit-

tents of this country to those of hot climates which are fatal in the second or third paroxysm.

There is a very different effect produced on the nervous system by the poison of inflammatory or synocha fever, to that produced by the poison of low or typhus fever, for typhus is not to be considered as merely a worse degree of fever than the inflammatory, though in tracing the symptomatic fevers of local inflammation, we saw that the high fever degenerated into a low fever,

In idiopathic fevers there is a specific poison to each, one producing synocha, another typhus, as small pox and measles are produced by different poisons, though the antients considered these but varieties of the same, as some now consider the different continued fevers to be, but we have mild and fatal cases of typhus or low, and mild and fatal cases of synocha or inflammatory fever; the fevers being distinct kinds, though as in fever from wounds, the idiopathic synocha can pass into the typhous state, and ague sometimes passes into a state of continual fever, kept up by visceral inflammation. The point to be considered is, not of fever being in proportion to an inflammation of the nervous system, but in proportion to a poison infused into it, by which all the functions are deranged, and consequently the frame more or less debilitated, and health not restored, until the unnatural secretions have been thrown off, and fresh nourishment taken into the system; if the dose of poison has been too great it stops the machine, unless remedies can be applied to relieve the parts most oppressed, until the brain and nervous system recover, to renew or resecrete that influence which they lost by

the poison, and without which they cannot impart energy to the organs.

It has been pointed out that one thing necessary to the recovery of the nervous system is arterial blood, and to produce this of a good quality digestion and free respiration are necessary, yet from the very loss of power in the nerves the process of digestion is imperfect, and the lungs become congested in fever, so that one thing depending on the other mutually, they must each be attended to at the same time.

In whatever way the cineritious supplies the medullary matter with influence, it requires time, and we know from experience that stimulating only oppresses, without expediting the process; the digestion having been disturbed in the first instance, the food which was in the bowels, having been uniformly spoiled, must be removed, as it cannot give good nourishment, even if not a source of irritation from its undigested state, and it is no use to supply other than light drink, until some renewal of energy takes place; the lungs being congested it is useful to take away some blood by which means the remainder is better arterialized, and will thus more quickly restore the nervous system, besides that, in inflammatory fever, there is a direct indication for bleeding, to relieve the inflamed parts, whether the brain itself or other viscera.

We have more difficulty in shewing the advantage of bleeding and sedative (contrastimulant) remedies in typhus fever, in which there is universal debility, the brain and nervous system is weak, digestion and secretion weak, the different viscera in a state of congestion, the respiration weak, the lungs overloaded with blood,

the circulation weak, and the heart after death constantly found soft and flabby.

Now under these circumstances the object is to restore the nervous system to strength, but stimulants do not strengthen it, rather by temporary excitement still farther exhausting it, it must be by gradually supplying it with arterial blood, that it will recover itself; now supposing that the heart is still capable of being stimulated to increased action, the increased action only tends to overload the congested capillaries of the brain, with blood, which from the congested state of the lungs, is less perfectly arterialized, as is evident from the lividity of the lips, &c., thus adding to the oppression of the nervous system, and rendering matters worse, and the animal will begin to decline. But the heart is not always capable of being stimulated to increased action, the effect of stimulants upon a healthy heart is to make it more sensible to the presence of the blood in it, in consequence of which it contracts and empties itself with greater force, making the pulse fuller, but when, as in typhus, the heart is really weak, and deficiency of nervous influence exists, stimulants only increase its sensibility to the presence of the blood, so as to cause it to make more efforts, but that effort unavailing, so that it struggles against an over-load, and so only becomes more exhausted; stimulants not giving power but only calling forth that power which exists; thus you may compare the heart in typhus to a tired horse, in a loaded cart, coming to the foot of a hill, unable to ascend it, the stimulus of the whip may make him struggle to the attempt, but if urged he will at last sink; if some of the load be taken off he can rise the

hill, if some blood be drawn the pulse will rise, as is well known in the sunk state of the pulse in severe inflammation of the lungs or bowels, but not so generally acknowledged in typhus, but again if the horse without being either stimulated by the whip, or having his load lightened, be allowed to rest, he will be able to ascend; and without either stimulating on the one hand or venesection on the other, the heart will also recover and the pulse rise; and here we come to the explanation of the manner in which saline, antimonial, and other sedative (contrastimulant) medicines, and means, such as cold externally, are beneficial to the pulse in fevers, both where it is too strong and where it is too weak but at the same time the temperature is above the natural standard; it is in both cases by repressing the expenditure of nervous influence in sensation and motion, in consequence of which the heart struggles less, takes repose, and at the same time capillary action is increased, by which the nervous system recovers power, by the diminution of the coma of plethora, which exists in typhus, not from over power of heart, but from weakness of capillaries.

Thus we see two modes of diminishing the exertions of the heart, the necessity for which is universally acknowledged when the pulse is too strong and frequent; but it is not so generally acknowledged that when the pulse is frequent and weak the heart is also over-exerting itself, the blood being in each case not only what is to be moved by, but the excitant of action to, the heart.

The diminution of organic action in the heart will diminish the efforts equally with reducing the quantity

of blood, that this the effect upon the heart of salts, antimony, and other emetic, and purgative substances, besides digitalis, &c., is obvious to every one who has felt the effect of a dose of salts, or an emetic, on the pulse; the effect of cold externally, or cold drink is also sedative (contrastimulant), as is known by persons who when exposed to inclement weather in travelling, can swallow spirits undiluted, though unaccustomed to it, and which under ordinary circumstances would produce a sense of burning in the throat, and intoxication.

Now though emptying the intestines is useful in fever, it is not to the evacuating properties, but the sedative (contrastimulant) effects of those medicines that the be-benefit is attributable, and of this we have sufficient proofs, first, antimony controls fever, without either producing vomiting, or purging, as we know in the present day when we use small repeated doses of tartar emetic, with, or without salines, as febrifuge medicines, again, when formerly James's powder was much used for the same purpose, it was a common observation that it appeared often most efficacious where it produced no evacuation of vomiting, or purging, perspiration I do not call an evacuation, being only an evidence of returning function of the skin from decline of the fever.

The successful practice of Broussais is another proof that the sedative (contrastimulant) effect of abstracting blood, watery diet and withholding stimulants, can operate sufficiently in many instances in spite of what others call his neglect of the bowels; at the same time that I grant this I can not consider fever to be gastro-

enteritis, though it is true as was shewn above that in almost every instance, from the secondary loss of tone of the primæ viæ, and consequent unnatural state of their contents, more or less gastric irritation, and indeed inflammation or congestion must be a concomitant of fever, as in fact dissection proves. Arguments drawn from successful practice are often fallacious, and I say the cure of fever by abstracting blood from the belly by leeches is no proof of gastroenteritis being the proximate cause of fever, any more than that the seat of disease is in the arm if cured by taking blood from that part.

I once met with an assertion that the seat of hooping cough (pertussis) was the head, because leeching the temples relieved it,leeching any other part would have had nearly the same effect; by some persons blood is taken from the feet to relieve affections of the head, in preference to taking it from the head.

I have endeavoured to explain why in typhus we should avoid stimulants as much as possible in as much as the brain and nerves being in a diseased state of conjestion neither they nor other organs have their power increased by them, whereas by indirect practice, as it is called, we relieve the organs and give them an opportunity of recovering themselves.

After all this it may be asked, how it happens, that stimulants sometimes save the life of patients in typhus; in the states hitherto considered the heart was not deficient in perception of the presence of the blood, it exerted what strength it had, but from the violence or long continuance of the fever it will sometimes flag before the nervous system upon which the vital powers

depend, has made any progress towards amendment, the patient will in fact begin to die, the pulse fluttering, with cold clamminess on the skin; it is now that artificial stimulus will sometimes renew enough of action, to allow more time for the nervous system to recover if not already too far exhausted, or if the respiration be not already too far gone to arterialize the blood, in which case life cannot be sustained, as may be seen when the pulse is kept up unavailingly for many hours by stimulants before death. The point at which stimulants may be administered is one of the utmost consequence in practice, involves great responsibility, and requires experience to ascertain.

Those who stimulate early, by making the heart over exert itself, and expending the nervous influence, actually bring it and the nervous system sooner to that state described, in which more stimulus will be necessary to carry the patient through, and from observing the phenomena they become persuaded that they have been pursuing the right plan from the beginning, because of the necessity at the last, when the diathesis of disease has been changed, the moribund state of collapse producing a state of coma of inanition favorable for the action of stimulus, for if capillary action, contraction, has not recommenced death must take place.

Those who relieve the system early will diminish the duration and violence of the fever, but as there is a poison introduced into the nervous system from which it requires some time for it to recover, under all circumstances, the young practitioner must not be misled by representations and publications, to think that by violent measures fever may be cut short all at once, there are

some cases which occur apparently to support the opinion of profuse bleeding, &c., checking idiopathic fever at once, but I am more inclined to think they have been cases of symptomatic fever, depending on some internal inflammation. Idiopathic fevers, as far as I can judge, run a definite course, though we have not such accurate information with respect to them, as small pox, measles, plague, and other febrile diseases produced by infection, which also may be mitigated but not stopped. There are plenty of cases of small pox in which if it were not from danger of infecting others, the patient could go about his business long before the crusts have fallen off, and in many cases of fever the symptoms relax a week or a fortnight earlier than in others, and both severe typhus and small pox may be protracted much beyond the ordinary duration if not eventually fatal.

From the histories of fevers, and from observation and experience, I deduce, that the poison of continued fever is generated by animal matter, the poison of ague and remittent by vegetable, and I suspect from some cryptogamous vegetable, as being generated chiefly in situations where these are met with, such as marshes, uncultivated places, &c., for instance those parts of Rome in which the mal-aria exists are where there are deserted buildings, where in the shade cryptogamia abound, in London we have many cases of ague arising from mal-aria, in places inhabited by the poor, where there is warmth, shade, and manure, favorable to fungi &c.; when marshes are drained and cultivated the cryptogamia are destroyed, and agues are not generated, the tremendous remittents of hot climates, are chiefly where the ground is at times covered with water, and

where after the rains have subsided, it remains half wet, and then produces rank and unwholeome vegetables, especially where there are uncleared woods. The Bombay fever the most intense of agues being one which was almost uniformly fatal in the first cold stage, is only known by history, not having been observed since the ground was cleared and inhabited.

It may appear as if having said so much against the misuse of stimulants I were inclined to deny their utility in fever, but I have shewn one state in which they become necessary, and they are of the greatest use the moment the fever has ceased when the influence of the poison has passed off, which has been called the crisis, (when the diathesis is changed), there is then often so much real debility that the patient's recovery (convalescence) would be very tedious, or perhaps, the powers of digestion, &c., not equal to restoration, if not assisted by stimulus; and wine to promote appetite and digestion, and opium to procure sleep, may be of the most marked benefit when fever is gone. But how is it to be known when fever is gone? by referring to its essence, the loss of function of the nervous system. The fever is gone when the nervous system begins to regenerate nervous influence, when the intellects become clear and volition free, however weak, for subsultus may still remain and other marks of great debility, and there may be debility of brain amounting to childishness but delirium is gone, and the eye follows objects, besides the evidence of renewed secretion in the mouth, nose, skin, &c. &c.; patients themselves can often refer to the time of the fever passing off, by the mere return of consciousness, but even then we may have some

difficulty in conducting them to perfect health, by food, tonics, narcotics, stimulants, and occasionally perhaps a recurrence to sedative evacuations according to the changes which take place.

Having taken a view of the train of symptoms denominated fevers, symptomatic, or idiopathic (pyrexiæ), which I trace to a loss of the functions of the brain and nerves, and subsequently of the organs depending on them; we next have to consider another state which is induced by local injury, and is also a derangement of the nervous system, though different in the phenomena, denominated constitutional irritations (neuroses); the leading characteristics of which are pain, and a tendency to spasmodic, convulsive, involuntary motion; and it is necessary to keep distinct views of these different states of disease, though they sometimes run into each other.

In explaining irritation of the nervous system we must still refer to the principle of disease being only the alteration of healthy actions; the sensibility of a part morbidly increased becomes pain, and the part is said to be in a state of irritation. This irritation is in the nerves and is local, it exists often without that participation of the vascular tissues which constitutes inflammation, but often at last brings it on, it is sometimes propagated to the rest of the nervous system and brain, becoming what is called constitutional irritation, and the consequence of the brain becoming in a state of irritation, is, that its healthy actions are deranged; that is to say, in health the brain communicates to the muscles of voluntary motion, the dictates of the will only, but if the origin of the nerves of a part in the brain be irri-

tated, that part is thrown into action independent of the will, or even against its dictates, and this is the explanation of involuntary motions, called convulsive, or spasmodic, as when a spicula of bone within the skull, or a tumor pressing on the brain produces convulsions, called epileptic, or a depressed fracture of the skull causes convulsions; now the same effect is produced if nerves be long irritated at a distance from the brain until the irritation spreading to the brain at the origin of the nerves of motion, makes it re-act involuntarily, and throw the muscles of voluntary motion into action, as we see in a minor degree when a person under the influence of pain clenches the hands, or grinds the teeth, and from this we deduce the rationale of lock-jaw, tetanus, hysteria, epilepsy, &c.

It is well known to those who have seen much surgical practice that epileptic convulsions as well as tetanus, will come on from the irritation of the nerves in an injured limb. We see that not merely pain will cause clenching of the hands and teeth and other involuntary motions, but that mental excitement such as anger, grief, fear, &c., will do the same, and what medical man is ignorant, that fright will bring on epileptic fits, that a person may be tickled into fits, that certain pleasurable sensations in excess may produce epilepsy; that continued irritation in the bowels by worms though scarcely, or not at all, perceived by the individual will produce convulsions, in fine, that convulsions, involuntary actions of the voluntary muscles are produced by whatever excessively irritates the brain whether that be mental or corporeal, as when hysteric convulsions take

place, the spasms of tic doloreux, epilepsy from fright, &c., tetanus from wounds or cold, hydrophobia, delirium tremens, &c.

Now I am induced to consider the proximate cause of these affections an opposite state of the brain and nervous system to that of fever; irritation from over contraction of the capillaries and the coma which occurs not that of plethora but inanition, convulsions occur in animals bled to death, tetanus from cold, epilepsy from fear, delirium tremens from deficiency of stimulus, hysteria increased by debility, &c. &c.

In mere local irritation the pain is commonly great in proportion to the perceptible alteration of structure, as in painful affections of the stomach, uterus, gall bladder, colon, &c.; whereas many serious and destructive inflammations combined with fever give but little pain, the degree of constitutional or general irritation is not always proportioned to the local pain, or inflammation, but often much greater; nor has it been hitherto explained why one gun shot wound of a limb should produce fever, and an apparently exactly similar one lock-jaw; fever and irritation are by no means necessarily connected; on the contrary though continued severe constitutional irritation may be accompanied by febrile excitement of skin and pulse, we must be cautious in depleting, as depletion increases the irritability of the nervous system, and this in some of the irritative diseases a difficult point to discriminate in practice, when an organ of importance appears to be implicated, as hysteria simulating peritonitis, pericarditis, pleuritis, or phrenitis. We must not however underrate the consequence of irritation though it be not

fever, for it sometimes proves fatal; we may consider gout of the stomach to a mixed case of that kind, and it is relieved by treatment different from what we should resort to in inflammation of the organ with fever, in which we should employ depletion and antiphlogistic means; for in gout in the stomach we must immediately resort to laudanum and brandy for the relief of pain and irritation. Again another instance of irritation, that is, pain without fever, though sometimes with considerable flush of surface, is after parturition, where in many cases an inexperienced person would suppose from the tenderness on pressure of the abdomen, that there was necessity for bleeding, whereas all that is requisite is an opiate and quiet, and bleeding or purging would be highly injurious, the tenderness being only from irritation of branches of the nerves communicating with those of the uterus.

In many instances where there is inflammation, if there be also much irritation, evinced by pain, this is the most urgent and dangerous symptom as in cases of poisoning by oxalic acid, cantharides and other acrid substances, large doses of tincture of opium are necessary, and remedies which are of use in inflammation with fever, are of no avail in irritation. Another instance of the contrast between fever and irritation, is the state of a patient in delirium tremens.

This disease is analogous to the state described (p. 50) of a weakened action of the brain induced by forced watching, in delirium tremens the weakened action of the brain is from the absence of accustomed stimulus; in those who are in the habit of using much stimulus if suddenly deprived of it either from accidental cause, or

from voluntary refraining, or from its being forbidden on account of some symptoms of disease occurring, the want of the usual stimulus in the trunk causes diminished expenditure of nervous influence and the bowels and heart become torpid, as under the operation of digitalis, or other sedative, the brain at the same time being sound remains in full activity but weak from the want of arterial injection, and of the usual stimulus, there will be also capillary irritation, keeping up succession of thoughts rapid but weak (delirium); wakefulness (pervigilium); the weakness of volition causes trembling whence the denomination tremens. (I here give but the leading symptoms, the student will find the detailed description Lond. Med. and Phys. Journal, Jan. 1813, and elsewhere). Delirum tremens is a state analogous to that produced by sedatives, which if slight will pass off, but upon which at last, if not relieved, succeeds the coma of inanition and death. The only mode of counteraction is by stimulants which will be the more efficacious if combined with the narcotic principle as in opium, by which in addition to the counteraction of the sedative state, a greater tendency to sleep is produced. At the same time that the patient is using excessive muscular action, and raving, the pulse is frightfully weak, as in persons dying of hœmorrhage; stimulants and opium must be given freely until they counteract this state, and the patient must be confined to bed, for if allowed to run about as they are inclined from the delirium, syncope would ensue. You first perceive the brain recovering power evinced by more steadiness of the ideas, and rationality, then calmness, then sleep, and you cannot with safety relax stimulation until the patient sleeps,

or the raving will return, sometimes the patient will sink into sleep without becoming rational, but a calm of the sensorium will usually be perceived first, and increased firmness of nervous system evinced by less trembling, &c.

Friends or attendants who do not understand the nature of the affection, and have been accustomed to consider all delirium as what has been called determination to the head, and requiring depletion; too often have resorted to bleeding, and purgatives, and other sedative (contrastimulant) medicines, which increase the mischief; and they will even remonstrate sometimes against the exhibition of the only remedies which are efficacious, when ordered by the physician; the bowels are usually torpid, and will remain so until stimulants, call forth the nervous influence in them, and hence the administration of the sedative cathartics are not merely useless, but by counteracting the stimulants rather retard than promote the cure of the patient; the bowels will in general act of themselves, when the energy of the nervous system is restored by stimuli, and then it is time enough to give laxatives if necessary when the urgent symptoms are removed; "a little (medical) learning is a dangerous thing" and heaven help the medical man who has to contend with the friends of a patient who have a smattering.

Now there is an analogy in the constipation of bowels in tetanus, who has ever succeeded in purging a tetanic patient by the most drastic medicines, until the nervous system was relieved, nay is it not probable that the quantity of sedative medicine given has often counteracted the stimulants and opium which might have cured; the jumble of treatment hitherto adopted, has been such

as to defy any calculation upon what has done good; opiates, and stimulants, counteracted by purgative sedatives; hot baths counteracted by sedatives, cold baths counteracting stimulants; bleeding opposing wine, brandy, and opium; cases of tetanus have recovered under the employment of warm baths, stimulants and narcotics, from which and various analogies I prefer the treatment by stimulation and opium in tetanus, and if any addition be made it should be that of powerful tonics, not sedatives, (contrastimulants). We have succeeded in finding the mode to cure tic doloreux, and delirium tremens, which were once opprobria medicorum, why may we not by investigation and analogies succeed at last in curing tetanus, or that most dreadful of human inflictions hydrophobia; recollecting that when the patient cannot swallow, opium &c., may be introduced into the system by applying it to a surface from which the cuticle has been removed by a blister, cautery, &c. I think one point is clearly made out, that where there is FEVER, loss of power from lesion of the nervous system so that nervous influence is deficient, it is in vain to attempt to excite action by stimulants, until by the cessation of the action of morbid poison, or inflammation, or a state of collapse, or the action of sedatives, the capillaries have resumed sufficient action to renew the nervous influence, and the delirium or coma of plethora ceases. That when on the other hand the nervous system is not in a state of loss of power from oppression, but from want of injection or stimulus, with IRRITATION, producing the delirium, or coma of inanition, stimulants are directly indicated, both as promoting the expansion of the capillaries themselves and increasing

their injection. Narcotics and tonics to be added according to circumstances.

There is an analogy between the circumstances under which trismus nascentium occurs and the coma of inanition of infants described by Gooch.

A state analogous to delirium tremens is well known to surgeons to occur after accidents and operations, which induces some to give an opiate almost uniformly after operation, and the surgeons formerly often gave one before it. This state comes on sometimes in hospitals, in the persons of patients who have been in the habit of drinking much fermented liquor; but we must not imagine that delirium tremens, or delirium sine febre, comes on in those only who use stimulants freely; it will occur in a variety of circumstances where there is irritation, and over excitement of the nervous system, with exhaustion, or a debilitated instead of plethoric constitution, some cases of this kind occur after parturition, in hysteria, in hypochondriasis, subsequently to apoplexy or wounds of the head, when much depletion has been necessarily resorted to, after hœmorrhage, sensual exhaustion, or over study, and anxiety.

In all these cases tonics are especially useful, and in some stimulants and opiates are necessary to prevent collapse, and in many to excite the brain to an increase of action, and in those cases where there is want of sleep, opium is generally preferable to stimulants alone, without any narcotic, as producing the tendency to sleep without so much increasing the force of the pulse, which may in some instances, such as the cases after apoplexy and injuries of the head be contraindicated, on account of the risk of increasing local injury; which cases some-

times place the most clear sighted practitioners in a difficult dilemma.

In many other instances of irritation, opium opens the bowels, it will do so in diabetes in which the increase of secretion of the kidneys is analogous to that in hysteria, it will do so in colica pictonum, and other cases of colic from sedatives; on the other hand it is well known to stop the diarrhea of irritation from sedatives, so that as Celsus said of venesection, we may say of opium, that it relieves obstinate costiveness, as well as obstinate diarrhea, the solution being that venesection is efficacious in removing inflammatory irritation with over distended capillaries, with pyrexia; opium in relieving irritation with over contracted capillaries from sedatives or the state of local congestion which succeeds that if short of inflammation, or fever; but the mere empyrical assertion without explanation might lead to injurious employment of sedative treatment in colic, or stimulant in enteritis.

Many cases of mental derangement are delirium sine febre, and would be aggravated by depletory, sedative, treatment, and the patient would either die, passing into the coma of inanition, or when the constitution began to give way, a change in the diathesis would take place, and a febrile relaxation of the capillaries of the brain change the entire character of the complaint, as we know persons have become sane (or as it has been quaintly denominated, had "a light") before death, others have recovered from derangement in consequence of a febrile attack, as we have seen that vice versa a febrile attack may terminate in imbecillity, thus the

practitioner must be prepared to detect the changes of disease and vary his treatment accordingly.

In most of these cases the state of the skin assists much in the diagnosis, though not available in the complicated ones, but the strong distinguishing mark of fever is the loss of power of the nervous system, the languid eye of fever strikes the adept at once, the disturbances of other functions are matter of enquiry, but at the first glance you see more or less incapability of voluntary motion, a patient who is not feverish will keep still on account of pain, as in rheumatism, &c., but the eye will follow objects, or the deranged patient may sit with fixed eyes in cataleptic stillness, but in fever the eye is dull, the body prostrate.

Local inflammation produces sometimes fever, and sometimes constitutional irritation, which are different states but alternate and pass into each other, so that we are obliged to vary our treatment according to circumstances, for instance as long as the inflammation is producing fever we must use antiphlogistic means, when the fever remits we use tonics and stimulants to restore the strength. Ague is more properly constitutional irritation than fever, there is a great degree of congestion of the nervous system as well as of the viscera succeeding to sedative irritation, but rarely is there real fever produced, there is the pyrexia equivalent to what occurs in hysteria, and other irritations, but seldom actual fever, not that loss of power in the capillaries of the nervous system which prevents the generation of nervous influence, for in ague stimulants do not produce the coma of plethora, the nervous system being uninjured though under

a sedative impression is relieved by stimulants and especially by the stimulant narcotic opium, and consequently fresh energy communicated to the capillaries, even in the hot stage, by which they resist the heart's injecting force, unlike the effect of stimulants in fever. Yet in some agues the paroxysms are accompanied by coma or hemiplegia when the brain is unsound, though the pulse is weak, as in the state of debility with irritation after apoplexy, and wounds of the head. Sometimes visceral disease converts ague into continued pyrexia, and in pulmonary consumption there is the mixture of fever and irritation from inflammation, and the term irritative fever is sometimes applied to this combination, in surgical diseases.

Thus we see inflammation destroys life in various ways, by fever alone as the acute inflammatory diseases such as peripneumonia or enteritis, and the results of accidents; others by alternation of fever and irritation, as hectic; others by irritation alone, as tetanus and hydrophobia; and cancerous disease has more the character irritation than fever. Fever is not a higher degree of disease than irritation, produced by inflammation, since irritation may prove fatal without fever, as tetanus, epilepsy, &c. This kind of distinction will be found useful in practice, and I believe, if followed up, may lead to more definite and successful practice in many cases than has been hitherto obtained. The disease called acute rheumatism or rheumatic fever, is not fever but irritation, curable by tonics.

There is not necessarily inflammation, at least not so as to cause discoverable change of structure, to produce irritation; for though there be some slight inflam-

mation preceding or causing hydrophobia or hysteria, fright will produce irritation sufficient to bring on epileptic convulsions in an instant, without change of structure in the brain; at least we see the most violent irritations without any degree of inflammation to call for depletory remedies, but which on the contrary are aggravated by them; as we see hysteric epilepsy increased by debility, and hysteric fits brought on or increased, when for some really inflammatory affection, we are obliged to deplete a patient who has tendency to hysteria; and in these cases sometimes, delirium with pain of head comes on simulating phrenitis, but which is mere irritation, that may be relieved by tonics with or without stimulants, and not by the treatment which cures phrenitis, though the skin be flushed; and these examples suffice to show the necessity for making a distinction between a constitutional irritation, and symptomatic fever, so much resembling each other, and yet requiring such opposite treatment, for the safety of the patient, and moreover, as it was shewn that these states run into each other, the treatment must be suddenly varied.

I may now offer some illustrations of the effect of stimulants, sedatives, and narcotics, singly in producing good results.

A boy was brought into the London hospital with a swelling of the knee, which was in constant pain, he had been in some days when I saw him, he was much emaciated, and irritable and languid, consumed by hectic feverishness, got no refreshing sleep from opiates, the pulse 130, thready or rather wiry, very hard, he was too weak to apply more leeches to the knee, though hot,

tender to the touch, and not bearing the slightest motion, as he kept it constantly bent, and could not bear it moved; the indication was to take off the injecting force as the vessels could not be otherwise relieved; fifteen drops of tincture of digitalis were ordered three times in the twenty-four hours; after the second dose he got better sleep than he had from the opiates, the pulse came down, and in less than a fortnight he grew stouter, as the knee grew smaller, and was able to walk home.

A medical student had swelled knee with great pain preventing rest, he was treated secundem artem, and amongst the rest by one of the best surgeons now living in England, he had not fever, did not emaciate, but was tormented with pain, and sometimes painful applications; one night, coute qui coute, he took what he imagined to be about a tea spoonful out of a bottle of tincture of opium; he slept twelve or fourteen hours, awoke free from pain, and very soon walked to the hospital without any more medicine.

Instead of a knee case, cured by stimulants, I can mention one worth attention as not of unfrequent occurrence, and of great consequence to be aware of. A young female had been treated for two or three weeks by bleeding, neutral salts, and low diet, for what was called determination to the head, supervening upon what had been considered a pleuritic affection; there was jactitation when I saw her, sense of oppression at the chest, incoherence of speech, severe pain of head occasionally causing her to put her hand to it, and to cry out, intolerance of light and sound, flushed face, but mark not fever, weakness but not sluggishness of

the voluntary motions; the pulse jerking as you find after hœmorrhage, but not firm; the tongue not foul, but white as you frequently see with an empty stomach. I ascertained the pain at the first to have been in the *left* side, and from other circumstances, I felt satisfied that the present state was clavus hystericus kept up by inanition, she had been allowed the day before a little weak chicken broth, but her being supposed not able to bear it caused my being consulted; wine and animal food gradually administered, without any medicine but a few drops of vinum ferri, soon calmed all the symptoms of what was called determination to the head, and health was restored in a few weeks.

These three cases will illustrate several points, here we see, 1st, Local inflammation, and irritation, combined with fever which it has produced, lesion of the nervous system; food and wine, affording no nourishment, narcotics no rest, cured by a sedative, digitalis.

2d, Local inflammation and irritation producing not fever (lesion of the nervous system) but constitutional irritation of it, chiefly evinced by loss of sleep, no indications for stimulants, sedatives, or tonics, and no want of strength or appetite, a narcotic by cutting off the communication with the nervous system gave it time to regain its natural state, and subsequently to give energy to the vessels of the inflamed part.

3d, Local inflammation and irritation (uterine), having produced, not fever, (lesion of the nervous system,) but irritation of it, constitutional irritation, hysteria; debility arising from want of nourishment, so that narcotics administered procured but temporary relief as giving no nourishment, and sedatives produce aggrava

tion of the symptoms, stimulants and food by giving strength acted as a tonic, restoring power to the nervous system, and consequently to other parts.

Though keeping the bowels open is useful in chorea, and in a variety of nervous affections, to promote the digestion, &c.; constitutional irritations, hysteria, &c., are always aggravated by much depletion, so that until food, and tonics give strength, there cannot be cure; now sometimes in constitutional irritation the patient cannot eat, any more than in fever, though from a different cause, sometimes there is no inclination for food from morbid delicacy of the senses of taste, and smell; sometimes from irritability of the primæ viæ a mouthful produces a sense of repletion; and this nervous anorexia sometimes increases the difficulty of distinguishing between fever and irritation, and particularly when the primary local irritation is in the primæ viæ from indigestion, simulating gastroenteritis, inflammation of the mucous membrane.

There is great difference between the state of a patient in whom there is considerable local irritation, causing sympathetic fever, and one who has idiopathic fever, in as much as there is in the first a much sounder state of the sensorium and nervous system, and they require different modifications of treatment, this will be more evident from stating two cases which every man of experience will allow to be drawn from nature, and closely resembling each other. First, a case of idiopathic continued fever in which, from the disturbance in the secreting organs, gastric irritation comes on early, the mucous membrane of the intestines being irritated by their unnatural contents, there is uneasiness of the ab-

domen on pressure, and great heat and dryness of the epigastrum, without either diarrhea or any obstinate constipation; along with this, languor, prostration of strength, more or less confusion of ideas, or delirium, evincing lesion of the nervous system, the essential marks of fever.

The other case in which, from a want of secretion of good bile, the food instead of being converted in the natural way formerly described, becomes putrid, acid, or otherwise acrimonious, not affording nourishment, and at the same time producing irritation. We shall here have the gastric symptoms, but instead of fever, there will be but feverishness, (pyrexia), from the disturbance communicated to the nervous system, head-ach perhaps, but not delirium, little languor until there is actual debility from inanition,

Now as to treatment, if tartar emetic be given in the dose of about one-eighth or one-fourth of a grain in water every hour, the effect upon the case of mere gastric irritation will be to produce sickness, by which the patient will be relieved, and immediately cooled, particularly if the bowels are opened by it at the same time, and a repetition of the tartar emetic will produce sickness each time.

But the effect of tartar emetic on the case of fever will be less marked, for though it may produce nausea at first with some diminution of febrile symptoms, yet the relief is seldom so marked, and if the medicine be repeated it does not produce nausea, but only diminishes the febrile symptoms, and requires to be persevered in to continue the controul over the fever, or may even require increased doses, and to be assisted by bleeding;

this latter case exemplifies what in the New Italian Doctrine is meant by a strong diathesis, in which there is great tolerance of contrastimulant medicines.

Now either case of disease may prove fatal, the fever by the gradual failure of lungs, heart, and brain; the gastric irritation by rapid marasmus; for though the contrastimulant cools the patient, and subdues the symptomatic fever for the moment, if digestion cannot be restored, the patient will rapidly sink, under renewed symptomatic fever, and inanition; and the same result takes place whether the disease be gastroenteritis, that is inflammation, or gastroenteric irritation, from undigested aliment, from want of secretion of good bile; now this case is an illustration of what takes place in infantile fever, infantile remittent, gastric fever of children; it is often cured in the commencement by a dose of calomel, either alone or with castor oil, or other purgatives, evacuating the primæ viæ, whilst at the same time the mercurial renews the secretion of bile, so as to restore digestion, and all goes on well, either permanently, or only requiring a repetition of the same remedies; but often the case is more obstinate, and a torpid, or perhaps we should say inflamed state of the liver requires not merely repeated doses of calomel or other mercurials, but leeches and poultices to the epigastrum, though the specific action of calomel on the liver is a great assistance, (as are all specifics when discovered). One of the embarrasing symptoms in these cases is a purging of a dirty watery fluid, but this must not dissuade the inexperienced from persevering with calomel, for as soon as it makes the motions yellow, this state will cease, or if diarrhea then continue as it will sometimes from

a chronic inflammation or irritation of the mucous membrane having been induced, astringents such as catechu or hœmatoxylum will cure it. Some of these cases though called infantile remittent, are little relieved by bark, unlike the genuine aguish remittents.

Here of course the cases are considered quite in the abstract, in particular diseases we employ a variety of astringents, opiates, laxatives, tonics, &c.; the symptomatic fevers in surgical cases often require antimonials to cool them. In distinguishing a really febrile state, that is lesion of the nervous system, from irritation, which is of so much consequence, we must not confound that languor which arises from nausea and other affections of the primæ viæ, as diarrhea, &c., with the languor of want of power of volition from the weakened nervous system of fever.

The student must recollect that *Irritation* alone affords not sufficient indication for remedies, as we see that irritation exists with either fever or inflammation, or without either.

Irritation, is local, locally sympathetic, or generally sympathetic (constitutional). Irritation is an affection of nerve, but nerve is nothing without capillaries, capillaries nothing without nerves; the isolated consideration of either leads to the error in practice, of attempting to relieve the vessels, at the expense of the nervous system, or of resorting to nervous medicines to the prejudice of the vascular system.

The irritation producing increase of secretion from mucous follicles in different parts, denominated catarrhs, may be combined with fever or not, as in catarrh of the air passages, diarrhea, or acute dysentery, hence

relievable by stimulants and opium, or by antiphlogistic treatment, according to the popular empyrical saying, "feed a cold and starve a fever," but those who cannot discriminate, sometimes feed a fever. If you can ascertain that there is not fever you may stop simple troublesome catarrh or diarrhea with stimulants or opium, either in recent or chronic cases, as in other chronic affections, such as chronic dysentery; but if there be active inflammation and pyrexia, as in acute dysentery influenza, &c., opium must be modified by sedatives, even if used for its narcotic properties, and stimulants withheld.

The griping of purgatives is accompanied by languor, the over-sedatived state of the capillaries produces irritation, but not inflammation or fever, stimulants and warm drink diminish the irritation.

The epidemic Cholera of the East (which is totally different from bilious diarrhea sometimes called by that name here) is an analogous state, produced by a sedative poisonous miasma from the ground, as ague is, and like ague sometimes prevailing and sometimes declining unaccountably; some years ago when agues were admitted into the London Hospital, we found that the patients had come from Cambridgeshire, Lincolnshire, Essex, or other fenny or marshy countries, but for the last few years we have plenty of cases arising in the vicinity, which I have been told by Drs. Baillie, Lister and others was the case forty years ago; and I should say that at the present time in London, there is an increasing epidemic tendency to irritability of the nervous system, in various affections.

The sedative poison of cholera produces with the

sickness and purging, excessive prostration of strength, to be combated by opium, laudanum and brandy with hot water, hot vapor or water baths, and fomentations.

Some give castor oil along with the stimulants, but many cases are cured without the oil, it may be of use, by promoting the passage of the stimulants along the canal, in case the opium should diminish the peristaltic motion in the upper parts, but this does not seem likely to occur in an injurious degree; some give calomel also, which may be of use to promote the healthy action of the liver towards convalescence, but, to save life in the urgent state of the collapse, stimulants are the direct means, and must be given not measured by the ordinary routine, but freely and repeatedly administered, only to be regulated by the tolerance of the remedies, tincture of opium from a drachm to half an ounce at a time, with brandy and hot water, in equal parts frequently repeated. Bleeding is often necessary with this stimulation because the action of the heart is so weak that it does not keep up enough of motion in the blood to prevent it from coagulating, and unless the freedom of circulation be assisted by venesection, the stimulants cannot give the heart power enough; and though the blood may have begun to thicken and "oozes out at first like treacle," the renewed motion as it flows makes it fluid, as blood is kept liquid by the butchers for particular purposes by stirring it.

We see uniformly that the effect of sedatives is to constringe the capillaries, and in the first instance independent of the vis a tergo, to diminish inflammation, so that however necessary to attend to the heart's action as influencing the pulse, we must continually refer to

the action of remedies on the capillary and nervous systems, as introduced to them through the circulation; we must bear in mind also that irritation accompanies opposite states of the capillaries; either that produced by over distension from inflammation, or excessive contraction by sedatives. Now this will lead us to the explanation of the tolerance of sedatives (contrastimulants) where there is inflammation, and fever, but not always when there is irritation only.

When the nervous influence is deficient in consequence of the injury and debility of the nervous system by feverishness of inflammation, or fever from morbid poison, it requires a greater quantity of that agent which produces the contractile action, either to bring the capillaries to their natural standard, to diminish inflammation, or to bring them below it, so as to produce that irritation of the mucous membrane of the intestines or stomach which causes purging or vomiting.

But when the nervous influence is abundant as in health, a smaller quantity of sedative will cause that consent of capillaries which produces contraction.

Hence there is less tolerance of contrastimulants in health than in disease, which will explain an error into which many have fallen, in over-estimating the powers of new medicines; for instance a small dose of colchicum given to a stout healthy porter will produce a depression far greater than if given to a weak person labouring under rheumatism or inflammation. A healthy individual will be purged by touching the tongue with the cork out of a croton oil bottle, not swallowing half of a drop, whereas it will take perhaps two or three drops to purge a person who is feverish.

Persons who are in the habit of taking opening medicines,find that a tea-spoonful of salts acts freely, but when feverish it will require four times as much combined also with senna, &c., to open the bowels. Delicate people whose nervous system is weak have great tolerance of purgative medicines, requiring constantly to resort to them, but free exhibition of tonics by strenghtening the nervous system will be a much better and more certain mode of keeping the bowels in order, and stimulants will have the same tendency provided there be no feverishness.

I feel satisfied that Hamilton's work upon purgative medicines was of infinite use, by doing away with prejudices which had been inculcated by some of the ancients, and that though it has led to a somewhat indiscriminate use of purgative medicine, yet that has been in ignorant hands an error on the safe side, instead of their resorting perpetually to opiates, as was the empyrical mode of giving relief before, and by which many inflammations were increased. One abuse I consider too serious however to omit mentioning, it is, the wanton administration of purgatives to puerperal females; the uterus though not in a state of inflammation after natural labour is of course in an irritable state, and the effect of lowering the female by purging is in many instances to make her hysterical; there are then sympathetic pains of the abdomen with tenderness on pressure brought on, flushed skin, restlessness, &c., as in hysteric unmarried females, the inexperienced or ignorant practitioner mistaking these inconveniences for symptoms of inflammation resorts to the lancet, and other depletion; the woman becomes more hysterical,

with more pain, debility, jactitation, &c. &c., occasioning serious embarrasment to the practitioner, if nothing more serious.

We have now to enquire into the nature of Dropsy, that morbid state of the capillary exhalants which sometimes results from Inflammation; and as Fever and Irritation though distinct affections, are frequently coexisting and complicated, so Dropsy is frequently combined with one or both of them.

Dropsy is an undue deposition of serous or watery fluid, by those capillary vessels of the serous membranes, and of the cellular tissue, which in a healthy state supply merely sufficient to keep those parts in a soft state.

Without for the present saying whether Dropsy be Inflammation or not, the proving or disproving of which proposition would not advance us in our investigation, I must observe, that the proximate cause of both is the same, a weakness and consequently giving way or enlargement of the capillary or minute arteries concerned; this cause I hold to be sufficient for the explanation of the phenomena, and as I denied arterial action to be increased in inflammation, so I deny that it is necessary, as many do, to refer to a diminished action in the absorbents as a cause of dropsy. I consider the action of the absorbents to be uniform, and that, though there may be, it is not necessary to suppose any alteration as to absorption, as a cause either of inducing, or removing dropsical effusion; for, considering the action of the absorbents to be uniform, merely to take up and carry off what is offered to them, it is evident that too great a quantity of fluid being poured out, the absorbents will not be equal

to taking it up fast enough, but when we act upon the arterial capillaries, so as to check their exhalations, we know that, the absorbents, continuing their action, will gradually carry off the overplus of effused fluid; and we know, that we can restrain the effusion from arterial capillaries, in two ways, either by constringing them, or by allowing less fluid to go to them; but of the absorbents we know no demonstrable mode of altering their action, and I hold that the *medicines* which are commonly *said* to *increase the action* of the *absorbents*, act on the *capillary arteries* so as to check their deposition, and that this is the true account of the removal of dropsical swellings, by the action of mercury and other medicines, which cause either an alteration in the action of the capillaries, so as to stop their depositions, or by causing evacuation, actually diminish the quantity of matter supplied by the arteries, as Elaterium and diuretics do in dropsy, and Mezereon, Daphne Laureola and other drastic purgatives and emetics do in syphilis, when patients are cured without mercury by starving and sudorific and evacuant medicines.

Dropsy is not a disease in itself, a primary disease, it is only a constitutional disturbance, a symptom, a state induced by some diseased organ; the partial sudden effusions which sometimes take place from inflammation of a serous membrane such as the Empyema of Lænnec, from the pleura, (which by the bye is not the Empyema of Cullen) should rather be called Inflammatory Effusion than dropsy.

Dropsy is induced by any protracted disease which by irritation or slow fever robs the secretory organs of

their nervous energy, as the kidneys, skin, and, intestines, but above all the kidneys and skin, and when they cease to secrete the redundant fluid oozes from the overloaded capillaries, not merely overloaded, but weakened, in consequence of the deteriorated state of the nervous system, and unless we can restore energy to the nervous system, so as to give tone to the exhalant capillaries, we in vain evacuate the fluid either by tapping, or by diuretics, or cathartics such as Elaterium.

Thus Dropsy is not to be considered as an isolated or single disease, except when, for a time, to prevent a patient from being overwhelmed by the fluid in the cavities, we turn our whole attention to getting rid of it, either by tapping, or profuse evacuation, as by hydragogue purgatives, or diuretics, and other medicines.

When we see a patient with dropsical swellings, our great object must be to cure the disease which produced the symptom of dropsy, dropsy being but a symptom.

It is true some cure both by attending to the one symptom alone, as when dropsy is the consequence of inflammatory disease of the lungs, pericardium, or liver, in which squills and digitalis are employed specificially as diuretics, with purgatives, to evacuate the fluid by the kidneys and bowels, and some form of mercury at the same time empyrically ; although the whole attention is given to the symptom of dropsy, yet the treatment is also applicable to the local affection ; and in such a case, often the primary and secondary disease are cured together ; and referring to local inflammation as the root of some dropsies, we can understand how in many cases, the abstraction of blood becomes a most usefal assistant

in the cure; as well as the advantage of bloodletting, when the heart and capillaries do not balance in power, for the mere object of taking off the injecting force of the heart, as for instance when the specific diuretics fail from the congested state of the kidneys, venesection often proves the most powerful diuretic, as sometimes the most efficient cathartic.

On the other hand, in Dropsy of broken down constitutions, as well as in Inflammations with failure of the vital powers, by referring to the influence of the nervous system, in giving strength to the capillary system, so as to enable the capillary arteries to contract and resist the distending force of the heart, we can understand how, in some instance, stimulants as wine, by increasing the nervous energy, and consequently capillary action, may restrain the effusion, when evacuation would sink the patient; so that dropsy like inflammation is cured by opposite treatment, according to the state of the constitution.

A fruitful source of dropsy is disease of the heart, organic alteration, especially hypertrophy, and imperfect valves, or, contracted openings, the effect of the hard pulse from hypertrophy being to cause over distension, at the same time that the capillaries from diminished nervous energy are weakened; for the obstruction, or regurgitation from imperfect valves causes pulmonary congestion, and deficient arterialization of blood, and cerebral congestion, both diminishing nervous energy, from which result capillary conjestion, evinced by dyspnœa, livid lips, &c., tendency to coma, diminished secretions, dropsical effusions.

In those cases we must be cautious in not endeavouring to do too much at a time, by over active treatment; when the cause is an organic alteration which cannot be removed, the strength must be supported though depletion be necessary, and yet whatever increases the action of the heart, by adding to congestion, diminishes the vital powers; so that there must be a constant difficult exertion of skill to preserve the balance between heart and capillaries, in which we are much assisted by the tonic medicines, which do not stimulate, and at the same time help to support the strength, under the operation of the occasionally required evacuants and sedatives.

Chronic inflammation of the liver, or other part, by wearing out the nervous system, which is called breaking down the constitution, induces also dropsy, from loss of power of the capillaries, very often partial, as ascites, from the exhaustion of the nerves of the abdomen, by continued sympathetic irritation.

This leads us to the rationale of another symptom, HÆMORRHAGE from the mucous membranes, which takes place under the same circumstances as dropsy, the exhalants from atony allowing blood to exude instead of moisture, and even the fine exhalants of the serous membranes sometimes allow blood to escape, which we find mixed with the dropsical lymph upon tapping, or after death.

Enough has been said to account for the capillary exhalants of mucous membranes becoming so debilitated, by sympathetic irritation or inflammation, as to allow blood to weep from them, it used to be commonly

said, and is still thought by many, that when blood is vomited, or passed downwards, or coughed up, that there has been a rupture of a blood vessel, but though this does sometimes happen, the most common source of the blood is the capillary exhalants.

Amenorrhea causes sympathetic vomiting of blood, so does chronic hepatitis, the local inflammation or congestion of the intestines in fever, and other affections, brings blood from the surface of the primæ viæ, bronchitis causes spitting of blood, and sometimes tolerably copious, without rupture of vessel. Now in all these cases, the symptom must not be combated by any specific treatment, no more than inflammation, or dropsy, but according to the state of the constitution, according to the distinction made of active, and passive hœmorrhages; the active by antiphlogistic means, bleeding, and sedatives; the passive hœmorrhages such as those at the close of fever, and many cases of menorhagia, most directly, and safely by opiates, with astringents of course, in both cases. And even after active hœmorrhages are subdued the patient must not be kept too low, as some strength is required to produce the healthy healing of parts which have been injured.

I have here endeavored to lay down principles in abstract, which may apply to particular cases of disease as they occur; for the explanation of phenomena referring to the action of nerves and capillaries, nerves and capillaries together, not artificially separated, but considered as they exist, ramifying with and supporting each other mutually throughout; by their combined action upon the blood, sent to them by the heart, pro-

ducing the phenomena of health; in their deranged actions producing disease. I have tried to explain the nature of remedies and have only to add, that in applying them, though not a moment should ever be lost, we must have patience in allowing them to act, remembering the precept *festina lente;* and that though inert practice is mischeivous the safety of the patient depends upon *ne quid nimis.*

FINIS.

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